The IRON AGE

DECEMBER 9, 1943

We can't lose time when we beat swords into plowshares

Peace will bring many complex world problems—political, social, and economic. But there are fundamental realities which this country must face.

Jobs! Jobs for millions of returned soldiers—for millions of ex-war workers.

Food! Food for the millions of undernourished or starving peoples in war ravaged lands.

Consumer goods! Fabrics, materials of metals and plastics, farm machinery, household appliances.

To supply the great postwar demands, American manufacturers must scrap old machines and equip with up-to-date machinery, or find themselves far behind in the race for domestic and foreign markets.

The truth is a large part of America's war materials is being produced on machines that were old at the start of the war and will be worn out and have to be replaced to meet the vast production demands of peacetime. Thousands of factories in America, in spite of war work, have not fully replaced old machines.

We had little time to convert to war—we'll have little time to convert to peace. Plan, and save precious time now.

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Warner & Swasey offers you practical help on postwar planning. We have a corps of engineers who are skilled in *all* machine operations involved in production of precision parts made of metal. They are helping many war plants improve methods and machines for greater production. They will continue to do so, but their services are also available for management interested in planning *now* for the future Write Warner & Swasey, Cleveland 3, O.

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This Week in The IRON AGE

Vol. 152, No. 24 — December 9, 1943

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The saving effected on steel through reduction in weight—without loss of strength or rigidity—has developed an enormous demand for Mahon Fabricated WELDMENTS, for a great diversity of purposes. But, even under this increased production pressure, deliveries as promised are closely maintained. You can be sure YOUR requirements will be handled with utmost care and despatch.
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The
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Dec. 9, 1943

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Maybe It Would Work

THE other day I was visiting the headquarters plant office of one of our large war materiel makers. What this plant has done and what it does from now on will be a considerable factor in determining the length of this war and the extent of the American casualty lists.

My talk with the operating vice-president was interrupted several times by people coming in with important messages. First on the list was Harry, the head of the open-hearth department. "The boys have gone out again," he said, "and the department is down." I thought by the way he said it that it did not worry him a great deal.

Next, in walked Bill, head of the forge shops. "They're down," he said, and let it go at that.

Half an hour or so later the door opened again to admit the chief of the aluminum foundry, with a similar message about his department. And an hour later the yard superintendent notified the operating v.p. by phone that the locomotive engineers who ran the yard engines had decided to stop work for one reason or another.

I said to my friend: "You people do not seem to get excited about these things. How come?" And then he proceeded to tell me why.

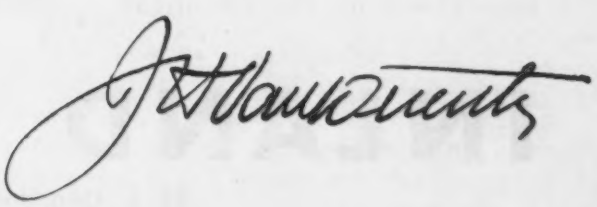
"If we let ourselves get worked up about these interruptions," said he, "which have occurred almost daily since we signed the union contract, all of us would be in the cemetery by this time or in the nut house. We do not believe that that would do us any good or the company or our country for which we are trying to make materiel to help win the war. Anyone else who stepped into our shoes would have the same experience and the wildcat strikes and outlaw sitdowns would go on just the same anyway.

"It would be different," he continued, "if the union leaders were able to maintain discipline, for practically all of these interruptions are unauthorized and are sponsored by rank and file hot-heads. But our work is so geared up that when a few of these fellows go out the whole department has to shut down of necessity.

"The trouble as I see it," he continued, "might be likened to the case of an engineer who designed and built a terrifically powerful engine but omitted to put the proper controls on it, so that it ran amuck at the slightest provocation and did harm instead of good. And mind you, I am not anti-union and favored our company signing its contract."

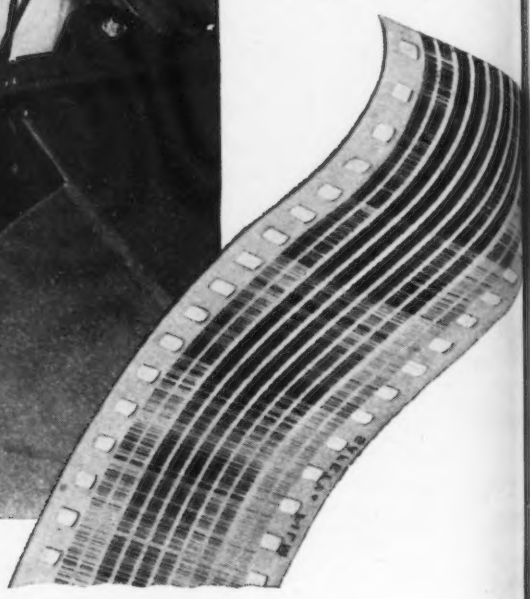
I told this story to a soldier back on leave from the Solomons. He was not anti-union either and in fact carried a card and had priority waiting for him when he would be discharged from the Army. "How many men are there in that plant?" he asked. I told him that it was over 20,000. "Give me 20 of my buddies and a free hand in that plant," he said, "and these troubles will be over."

Maybe it would be worth trying.



Examination of the spectrum emanating from the vaporization of the steel sample in an electric arc quickly reveals the chemical content of the sample.

A spectrographic film provides a permanent record of each sample.



How the Spectrograph Helps Maintain Inland Quality

Every open hearth heat run at the Inland mills is checked not only by routine control methods of chemical analysis, but also in a special spectrographic laboratory.

Inland was one of the first steel mills in America to install and develop technique for using the spectrograph in control of quality. An important advantage of this method is the rapidity with which tests can be made. At any stage during the working of a heat a melter can have an accurate check on the chemical content within ten minutes after a sample is delivered to the laboratory. Not only do these frequent and rapid tests assure the uniform high quality of Inland steel, but they also help maintain capacity production—a vital necessity in this time of war.

The spectrographic analysis is only one of the many checks and balances used by Inland in the production of steel—it is only one of the numerous quality control methods adopted by Inland after rigid tests prove their practicability.

ARMY E NAVY

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The IRON AGE
DEC., 9, 1943

NEWS FRONT

• United Steel Workers of America are now demanding the elimination of geographical wage differentials. Double time pay for the seventh day worked and time and a half for the sixth or seventh day although no work was done on previous days are other proposals.

• Plastics withstanding temperature ranging from a low of 60 deg. and a maximum of 150 deg. F. have been substituted in the B-24 for 66 parts formerly made of aluminum alloy. Eight to 12 layers of laminated canvas are impregnated with phenolic resins. Spruce and birch are also plasticized.

• Packard estimates its reconversion costs at 10 million. The armed services have agreed to pay 2½ million of this.

• For cold riveting base plugs of H. E. steel shell cases, a Coventry (England) firm uses a carbide tipped punch. Well over 100,000 base plugs are riveted by this punch without any maintenance whatsoever, against a maximum 150 previously obtained with a high speed steel punch.

• In spite of cutbacks and contract terminations, Charles E. Wilson expects 1944 war production to exceed 1943 by 20 per cent.

• Kaiser's agreement with the AFL Boilermakers to have its members tack-weld will save $62,000,000 on Naval and Marine contracts according to local estimates.

• There are over 20,000 outworkers in Britain, nearly half in the London region, who work individually in their own homes or in small groups in the homes of friends. Officially known as non-directable, immobile volunteers, these workers have graduated from small, simple assembly work to complex operations such as assembly of voltmeters, ammeters and coil winding for airplanes.

• The eventual cargo plane for domestic use will likely be a high wing type with floor close to the ground; trans-oceanic types will likely continue low winged for water landing.

• Loading advantages recommend the "flying wing" type of plane for large, low speed cargoes, but aerodynamic considerations rule it out for high speeds.

• Tricycle landing gear, providing level floor in ground position, has a practically certain future in air cargo transport.

• Army figures show 60 min. are required to transfer 1500 lb. from one of today's cargo transport planes to another and get it in the air. This can be appreciably cut by top, bottom, tail or nose loading, continuous cargo compartment, level floor, and bridge crane type conveyors, possibly of magnesium alloy, supported from the plane ceiling.

• Machine tool contracts entered into after June 30, 1943, will no longer be subject to renegotiation.

• A master drill jig designed by Larry Hagerman, Consolidated Vultee employee drills and reams 11 holes, mills 15 surfaces and back spot faces 11 forgings to close tolerances in three-quarters of an hour. These operations formerly required 3 hr. 45 min.

• Recent tests made in milling alloy steels at high speed with negative rake, carbide tipped tools indicate that the metal next to the face of the tools approaches the melting point of the metal. Colored movies confirm this, as incandescent chips can actually be observed. Incidentally, with negative rake tools, the faster the speed, the lower the tangential force on the tool.

• On a special miller for machining extruded aluminum alloy wing spars, one of the carbide tipped cutters operating at 6300 ft. per min. and 50 in. per min. feed sliced neatly in two a steel clamp bar which a green operator carelessly left in the way. No harm to the cutter. Shows what might be done on steel with stronger carbides.

• A new word has been coined to represent the noisiness of ball or roller bearings under test. Dr. E. J. Abbott of profilometer fame, says an "Anderan" is the r.m.s. angular (radians) derivative of the radial displacement (micro-inches) of the outer race of a bearing (as inner race rotates) per octave to the ½ power of the multiple of revolutions. Complicated as it sounds, it can be read simply on a dial for three ranges of pitch, from a growl to a shrill squeal.

. . . Machining of Arc W

By WALTER J. BROOKING
Director of Testing and Research, R. G. LeTourneau, Inc., Peoria, Ill.

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AMONG the most desirable characteristics of an arc welded machine is that the main functional parts of the machine may be fabricated from inexpensive rolled plates, bar stock, structural members or plate stock as received from the steel mills and, after it has been flame cut, sheared, rolled, pressed or otherwise shaped to the proper form, is fused together into a few solid, rigid, functional structures.

These working structures or functional units of the machine may be fastened together in their proper relationship and function with comparatively few machined parts which are integrally fused into the structure itself and which are bolted, riveted or pinned together so that the machine works as a unified whole.

As an example of this type of simple construction using a few strong welded structures which are held together by a few machined and moving parts, the large earthmoving unit shown in Fig. 1 is quite representative, in that it is composed of a single main body structure to which have been assembled a front gate, a sliding rear gate, a yoke, a push beam and a front axle structure, all of welded construction and all containing a few parts upon which there has been some machining in order to allow the main welded structures to function properly with relation to each other.

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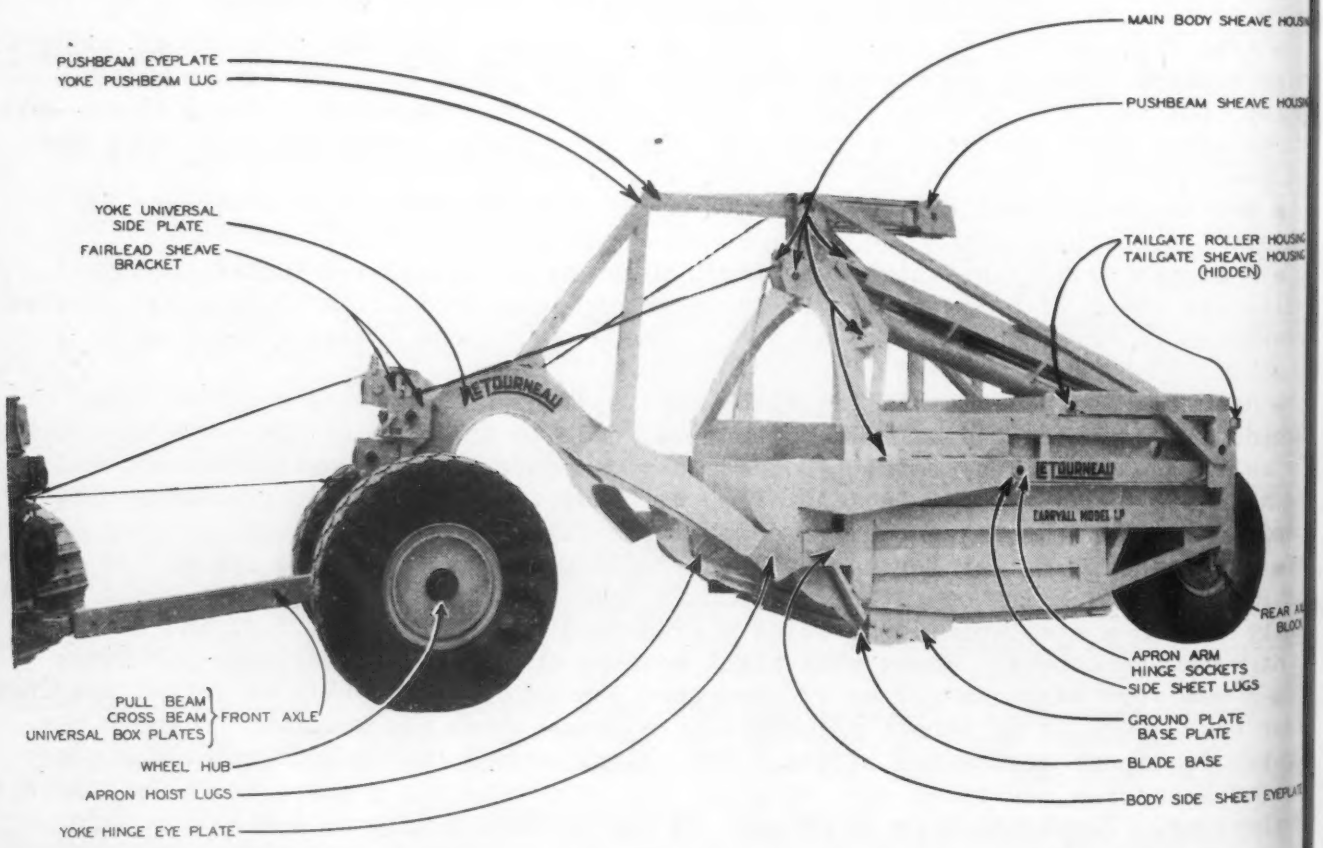
FIG. 1—A large, all welded earth moving unit, showing the relatively few machined parts of the machine. Most of these parts were machined as parts or small substructures prior to the welding of the parts into the final structures.

Fig. 1 diagrams the unit and labels in detail the separate pre-machined parts or structures which are welded into the completed scraper showing its fabrication.

The production of the main framework and structural parts of the machinery does not comprise the only application of arc welding, since many of the smaller structural parts which go into the main structure and many of the moving parts themselves such as gears, pinions, friction cones and hubs for wheels such as shown in Fig. 2 also may be made by the welded method of construction.

The fact that many parts which go into the construction of arc welded machinery may be machined as small parts, rather than after the whole machine has been unified into its final form (and therefore has become a considerably larger machining problem),



Welded Products . . .

presents a very valuable source of economy.

Another source of economy (and further example of adaptability) of the arc welded method of production of machinery is that a variety of materials and methods of production of certain functional parts of the unit may be applied, such as the use of steel casting or forgings for certain parts of the machine where the shape, special material requirements or the cost of the part may justify the use of forgings or castings.

These parts, such as the welded structures shown in Figs. 3 and 4, may very often be more economically machined and more easily handled, while they are still unattached from the main structure into which they will finally be unified and fused by arc welding.

Economic Considerations

An examination of the parts shown in Figs. 3 or 4 indicates that with perhaps the exception of the forging there is likely to be some variation in the concentricity (or thickness of metal to be removed) of the parts to be machined because of the method

. . . The author points out the possibilities of pre-machining parts and substructures while they are still small enough to be handled economically in machine tools and describes what precautions must be observed in the attachment of pre-machined parts to the main structure by welding and in combining large subassemblies to one another. In considering the fabrication of small parts by forming and welding, the author discusses economic factors of extra material costs vs. fabrication costs prior to machining and illustrates a special type of lathe designed to take hogging cuts.

of rolling bar stock or flame cutting plate stock, or both. Either plate rolling or flame cutting from plate, as practiced in the ordinary welding shop on a mass production basis, is likely to produce parts which are not as uniformly oversize with reference to all surfaces which will be machined as carefully made forgings or castings may be.

The problem of production of such parts, therefore, resolves itself to a certain degree into a problem of the economics of the cost of additional material on one hand compared to the cost of workmanship to produce parts which will have a uniform amount of metal to be removed from all surfaces rather than considerable variations from one area to the next.

In the production of heavy machinery like the earthmoving machine shown in Fig. 1, the parts are made from relatively inexpensive steel—either ordinary mild structural steel, carbon steel or even high tensile alloy steel. In manufacturing such parts as a fabricated wheel hub by rolling two bars of steel into bands and welding the bands together, or fabricating gear hubs and rims in the same way, there is an advantage in the use of a little more material than would be needed to make the parts if it were

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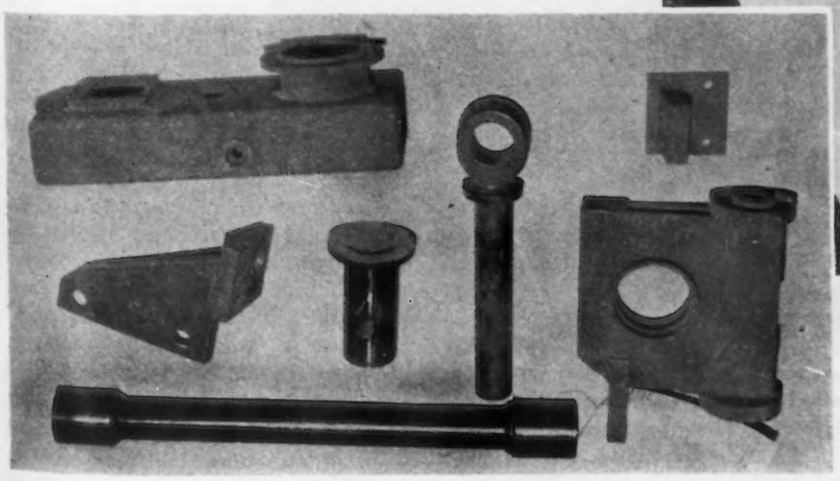

FIG. 2—These structures are examples of machined weldings, some of which are fast moving or heavy service units such as the long spline shaft, ground pin or swivel sheave housing, while others serve as bolt lugs, brackets or gear cases (lower right) without actually being moving parts.

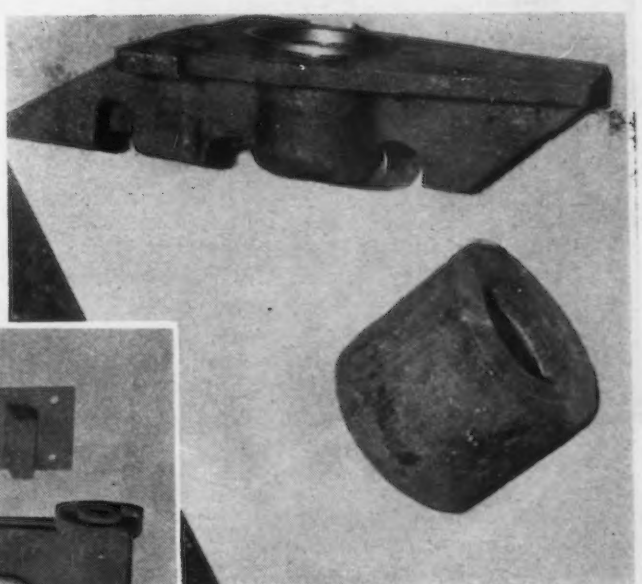

FIG. 3—A rough steel casting (right) and a rough forging, each of which will become a part of a welded structure after they are machined.

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rolled perfectly concentric and set up in the welding jig perfectly concentric, simply because of the relatively greater amount of expensive workmanship and precision machinery which must be used in order to roll parts accurately concentric.

Excess Material Often Justified

Frequently the initial operations (and even the finished operations) of rolling heavy bands are done by pressing them hot in a forming die. Beyond the first two or three press strokes the additional forming required to make them entirely round would cost more than the actual cost of the excess material which is machined off.

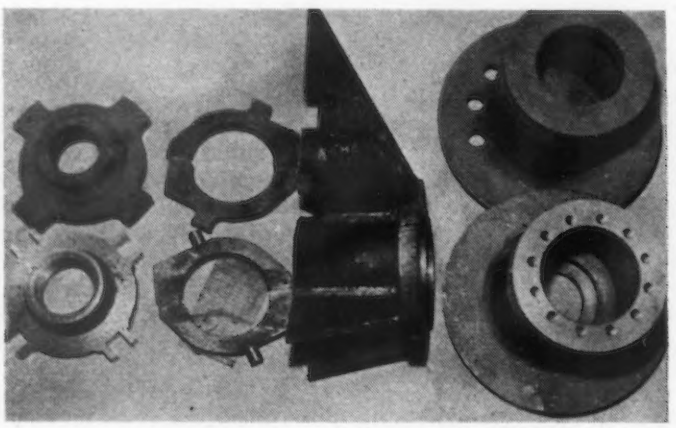
Often the number of parts being made in a production lot by the welding method does not justify the expensive machines, dies, fixtures and precision setups required for very close finishing prior to machining, whereas an order of several thousand parts might justify such a setup. In the absence of large members of structure, a little extra material is very good insurance against high scrap losses or salvage costs due to parts which crowd the margin of size too closely and won't "clean up" during the machining operation.

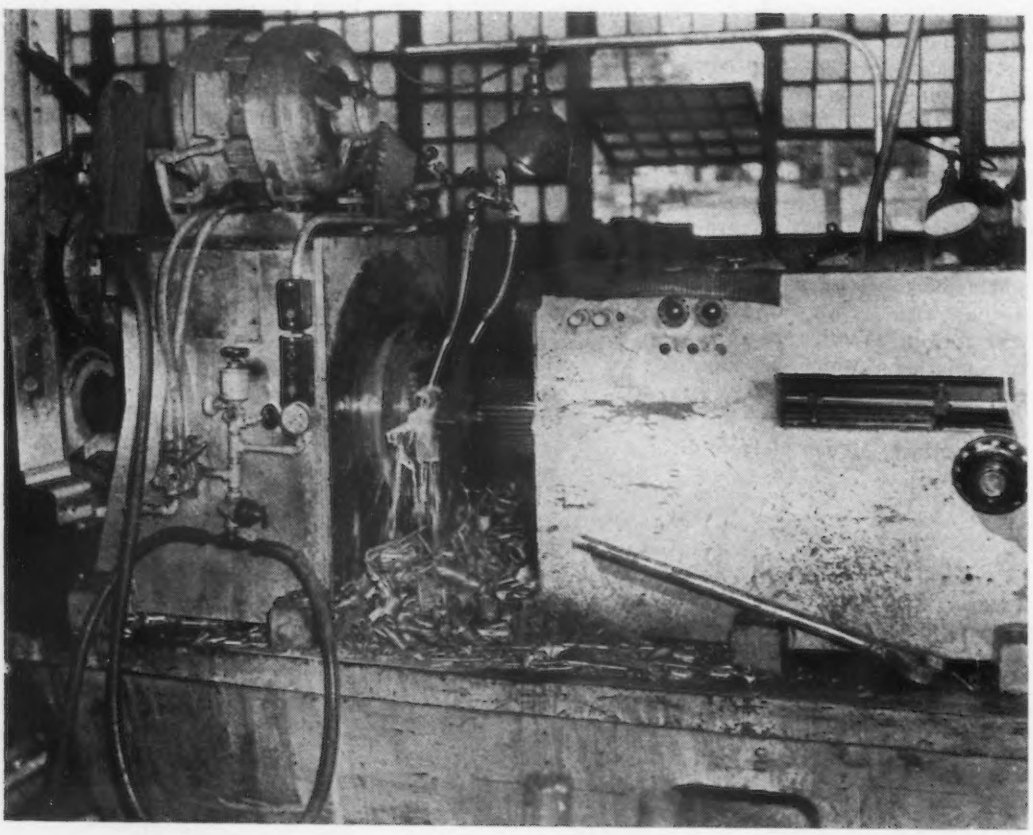
By the use of a liberal amount of relatively inexpensive material, the amount of precision workmanship needed in original cutting of the part components, forming them to shape, setting them up and actually welding them is considerably reduced. In a welded structure involving three or four separate substructures and therefore three or four setting up and welding processes, the additional workmanship which might be required by trying to reduce the amount of excess metal and to get a part which will clean up as uniformly as a very high class forging may accumulate into a rather expensive process compared to what it might be by use of a little more material and normally close workmanship.

Special Machining Problems

In mass production processing of moving parts for heavy machinery, the acceptance of the principle of the greatest overall economy by the use of a slight excess of material creates a machining problem which also must be considered in the balance of material versus workmanship and precision of the finished part.

In order to obtain the best possible economy in the machining of such parts as are shown in Figs. 3 and 4,





ABOVE

FIG. 4—Variations in the amount of metal removed in different portions of the same cut are almost certain to be encountered in machining these flame cut parts and welded structures. These differences in the same cut constitute a machining problem.

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LEFT

FIG. 5—This special all welded semi-automatic lathe drives a 6 in. slabbing tool across a flame cut part and makes a roughing cut which varies from less than 1 in. to over 4 in. total cut in each revolution of the part. Its rigid and rugged construction allows it to make the cuts quickly and accurately in spite of the variation in amount of metal being cut at different parts of each revolution.

for example, a semi-automatic lathe can be used for at least the initial stages of the machining of the parts. Yet in this initial manufacturing stage on a part which utilizes more material and less precise workmanship of component cutting, setting up and welding prior to the machining stage, there may be irregularities in the machining varying from a very heavy cut on one side to almost no cut at all on the opposite side in the same turning operation. This condition presents special problems of maintaining rigid tool-holding and part-holding devices, and the speedy removal of metal on an intermittent cut basis presents not only a challenging machining problem but an interesting machine design problem as well. The part must be able to take the heavy, lopsided cuts. Especially rigid and rugged machine tools excel on such application.

Special Lathe Built

In order to take full advantage of this type of construction, the semi-automatic lathe of all-welded construction shown in Fig. 5 was developed at Le Tourneau to facilitate the mass production of such parts. This unit consists of a rigid all-welded steel base upon which is bolted a welded gear case (head) which drives a heavy duty chuck of conventional design.

Facing the chuck and gear box there is an all-welded slide box which contains a traveling quill upon which are mounted the tools, which in their forward travel toward the chuck turn, bore, drill, or face the part. The advantages of rigidity and ruggedness which welding imparts to machinery is the largest source of economy in this semi-automatic lathe because it gives the high degree of rigidity and strength required to take the best advantage of inexpensive metal removal from parts which have been made with a minimum of workmanship and a reasonable margin of material in order to attain that minimum of workmanship.

The machining advantage which this type of lathe and this type of construction produces applies not only to welded structures, but also to forgings made with a reasonable excess of stock beyond the finished part, thereby reducing die costs which would otherwise be required for very fine forging contours. It also applies to certain steel castings wherein it is advantageous to remove a slight excess of the metal in order to get under the "skin" of the casting itself and increase the life of the tools used in cutting the part, or to use less pre-

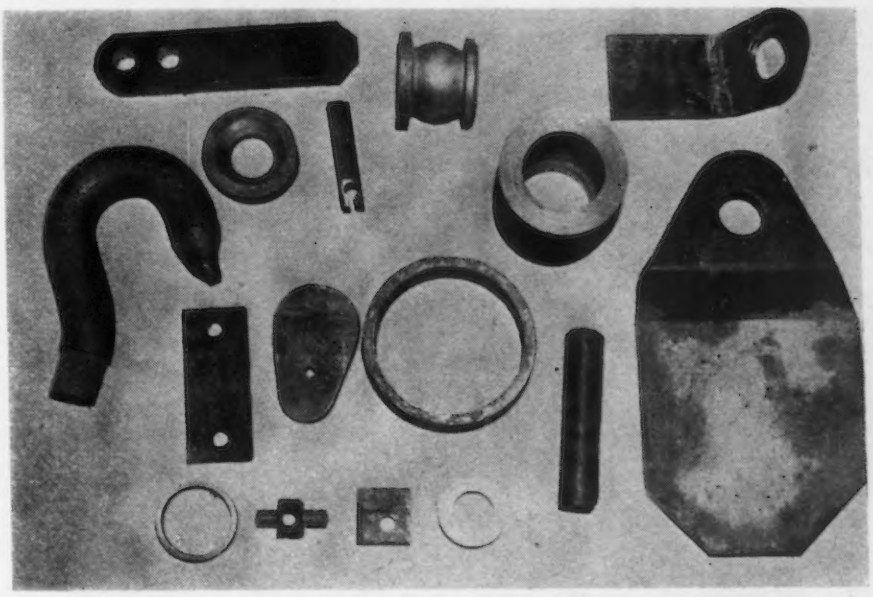

FIG. 6—These parts are a few examples of pre-machined parts which will be welded into fabricated structures and will save machining of the entire structure because they are pre-machined. Note that they are taken from ordinary rolled steel bars, plates, shapes and tubes.

FIG. 7—The relationships between the pre-machined and therefore important functional parts of this large earthmoving scraper body must be maintained accurately and positively. The pre-machined surfaces of the parts fit accurately against correctly placed stops on the setup fixture and assure proper alinement without machining the whole structure.

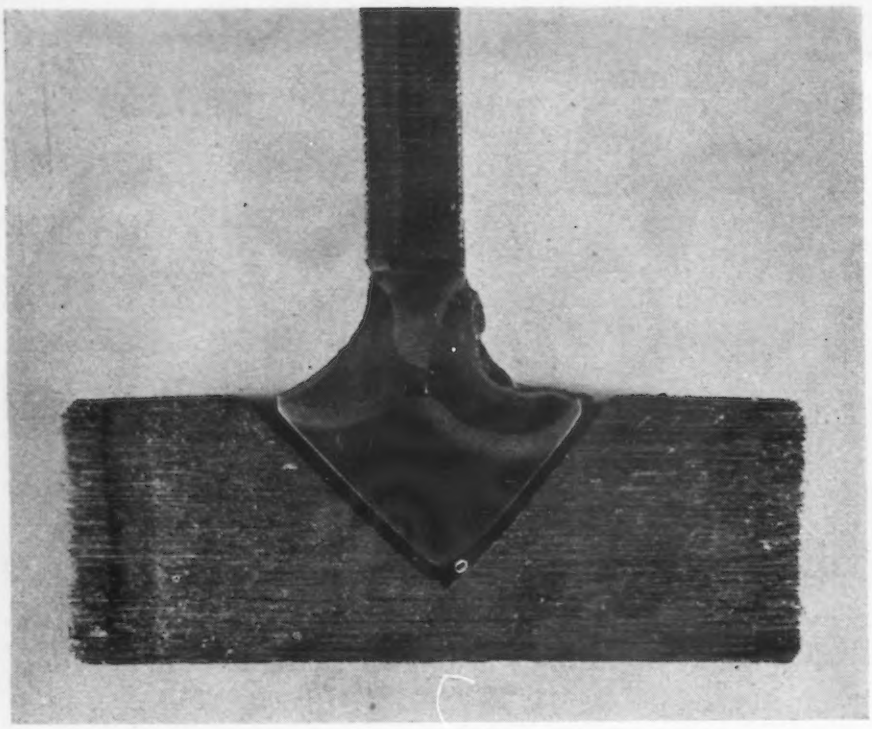

FIG. 8—A section of a welded T joint which has been removed, polished and etched to show the heat affected areas at the margins of the welded areas. These areas (light colored surrounding dark weld metal) are likely to be hard if the steel is high carbon or alloy and may cause broken tools or irregularities in machined finish unless they are avoided or removed by normalizing.

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cisely made and therefore less expensive castings.

For many parts the machining done in one cut on such a semi-automatic lathe as shown in Fig. 5 is complete enough for the purpose (to an accuracy of 0.001 to 0.002 in.). Certain other parts may require a closer tolerance of machining which may be accomplished by taking another cut in the same type of semi-automatic lathe, or it may better be adapted to a more conventional type of machine tool.

Pre-Machining of Parts

The variety of parts which can be pre-machined in the manufacture of arc welded structures is dependent for the most part only upon the resourcefulness and the imagination of the designers and manufacturers. Fig. 6 shows a few pre-machined parts cut from commonly available steel bars, tubes, shapes or plates prior to being welded into completed weldings.

The economy of pre-machining parts is rather obvious from the standpoint of the mechanics of machining. To handle and tool up for a small individual part rather than a large structure requires considerably less labor, machine capacity, complication of holding fixtures and space for the machining process in general.

The pre-machining operation may be a roughing process prior to a finishing operation, or may be a roughing process for parts which will be welded into substructures or completed structures and finish machined in that form. An advantage of this type of machining is that by rough boring, facing or otherwise machining the parts, setup points of location can be established by machined surfaces which will give positive location and accurate placement in the settingup fixtures prior to the welding process or prior to the final machining process.

Since the machined parts usually represent functional contact points in the assembly of a machine, it is essential that the parts be properly located in their correct mechanical relationship, one to the other, during the settingup and welding process. This is true of forgings, castings, parts made from plates, bar stock, structural members or stampings alike, and a machined surface gives a settingup point which is accurate to work from—obviously one of the important considerations in welded construction.

Fig. 7 is an example of a setup fixture for the location of pre-machined parts prior to their welding together in such a way as to maintain accurate relationships between rather widespread functional points of the machine.

Homogenous Parts Machined

One of the big advantages of pre-machining of parts is that they are usually of a homogenous nature during the machining process and therefore do not present the problems of machining parts which have, because of welding or other treatment, been rendered variable in structure in such a way as to interfere with machining. This homogeneity of parts is a considerable advantage since many of the machining operations on ordinary pre-machined parts are the common drilling, boring, turning, reaming, milling, bratching or hobbing operations where homogeneity of material results in a considerable amount of saving of tools and simplification of settingup and holding the work.

Many times the parts start as a simple piece of round, square, rectangular or odd-shaped stock, cut from plates or bar stocks, without further shaping or treatment prior to the machining operations.

A degree of caution must be exercised, however, in the machining of flame cut parts from high carbon (over 0.35 per cent) or alloy plates of structures, because of the fact that the heat of the cut causes a chemical segregation of the carbides and alloying elements and the adjacent metal in the heat affected zone is immediately quenched out from the mass of the material surrounding the cut. In the higher carbon steels and in many alloy steels, a very hard region is formed immediately around the flame cut area.

There are two ways of avoiding varying hardnesses around flame cut areas which will be damaging to the machining process either from the standpoint of accuracy or tool breakage. The first and most positive is the normalizing of the piece. If the material is ordinary structural steel, this entails heating it to 1200 deg. F. and allowing it to cool either in the air or in a furnace, depending upon the analysis of the part. The second method is that of removing a deep enough cut in the neighborhood of the flame cut area to get under the hard segregated area and, therefore, machine it free from the part without breaking tools.

Machining Welded Substructures

In the same way that the parts may be cut and pre-machined, so also may substructures be fabricated and machined prior to being welded into the final structure. The combining of dif-

ferent size rounds, squares, billets, structural members or plates to form bearing blocks, housings, machine bases or other substructures, offers a very economical way of placing masses of material where they are needed for structural or functional design purposes without attaining this massiveness by machining metal from large solid bar stocks, forgings or castings.

The machining of substructures which have been welded presents an additional problem over that of machining parts. The problem is similar to that of machining flame cut parts, in that there are heat affected areas near welds. Still another problem involved is that of locked up stresses resulting from shrinkage in the welds themselves and surrounding metal which may cause distortion. Relief of the locked up stresses by the removal of some of the metal in machining the structure may cause the parts to distort or otherwise shift out of shape.

On ordinary low carbon structural steel, or steel of the SAE 1010 to 1030 classes, welds and the welded locality usually are machinable without serious difficulty if an ordinary welding electrode has been used.

Fig. 8, on the other hand, illustrates the condition which is sometimes encountered in the locality of a weld in higher carbon steels or alloy steels which have not been normalized or stress-relieved and which if cut into in the process of turning, boring, milling or the other common machining processes, very likely will cause serious breakage of tools.

In the welding of such steels or of structures wherein the stresses set up by the welded joint may cause distortion in the machining process, normalizing of the parts is a good safety measure in order to avoid broken tools or scrapped structures which have sprung out of shape when the stresses were relieved by the removal of metal.

In the welding of high carbon steels (from 0.35 carbon up) which will later be machined, it is often a worthwhile practice to weld the structures hot because it aids in the prevention of broken tools and also because the welding operations often proceed much better hot than at normal temperatures.

Even if machining operations are not performed in the immediate vicinity of the welds, it often proves a worthwhile operation on high carbon welded substructures to normalize them in order to prevent tool breakage which results from hard spots caused by such simple things as a workman accidentally striking his arc or scratching his arc over the surface of the structure where it will be machined. Although it need be but a very small one, such a scar from the arc is sufficient to cause a hard spot large enough to break a tool or leave a flaw in the machined surface.

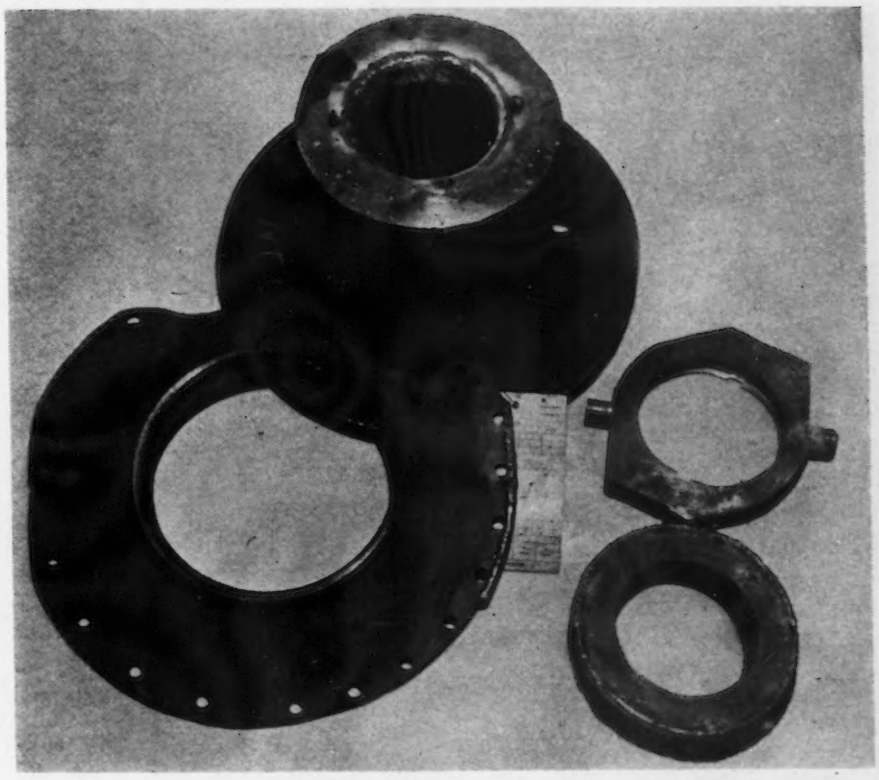

FIG. 9—Welded structures or steel parts may often be salvaged by building up the oversize bores or by padding up the areas that won't clean up, are turned too small or are too close to holes. These structures can be re-machined and thus salvaged for much less than the cost of making the part over.

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Repairing Machining on Structures

One of the important advantages of the arc welding method for producing steel structures, aside from strength, is the fact that during the machining process, if a hole is drilled in the wrong place, a bore is made oversize or some other machining operation is mistakenly done, it is often possible to build up the machined surface with weld metal and simply re-machine the part. Fig. 9 shows several parts which have been salvaged in that manner.

If the part is made of mild steel or low-carbon steel (SAE 1010 to 1030), it is usually possible to weld upon them with an ordinary AWS E-6010 or E-6020 welding electrode and build up a pad of metal which can be machined without normalizing. This method of salvage of small parts and substructures is a very effective means of reducing the amount of scrapped parts.

It is effective not only for parts and substructures, but in time presents a greater saving in the correction of mistakes on the machining of large structures which involve investment in a large amount of material and workmanship. It is not impossible to weld up such a mistake in machining without even removing the structure from the machine tool in which the work is done and, therefore, having to set it up for machining again.

Welded Jigs and Fixtures

For machining welded structures upon which there is a large amount of machining or where close tolerances of machining must be held in production of the units in large numbers, the use of machining fixtures consisting of frameworks made by arc welding is a means of accomplishing the machining without expensive individual layout work on the welded structure prior to machining.

For units such as gear cases, or even simple plates or structures where there are holes to be drilled, reamed or bored, the building of a simple drilling jig into which hardened and ground bushings are inserted and upon which are welded stops or other means of locating the part with reference to some special surface greatly

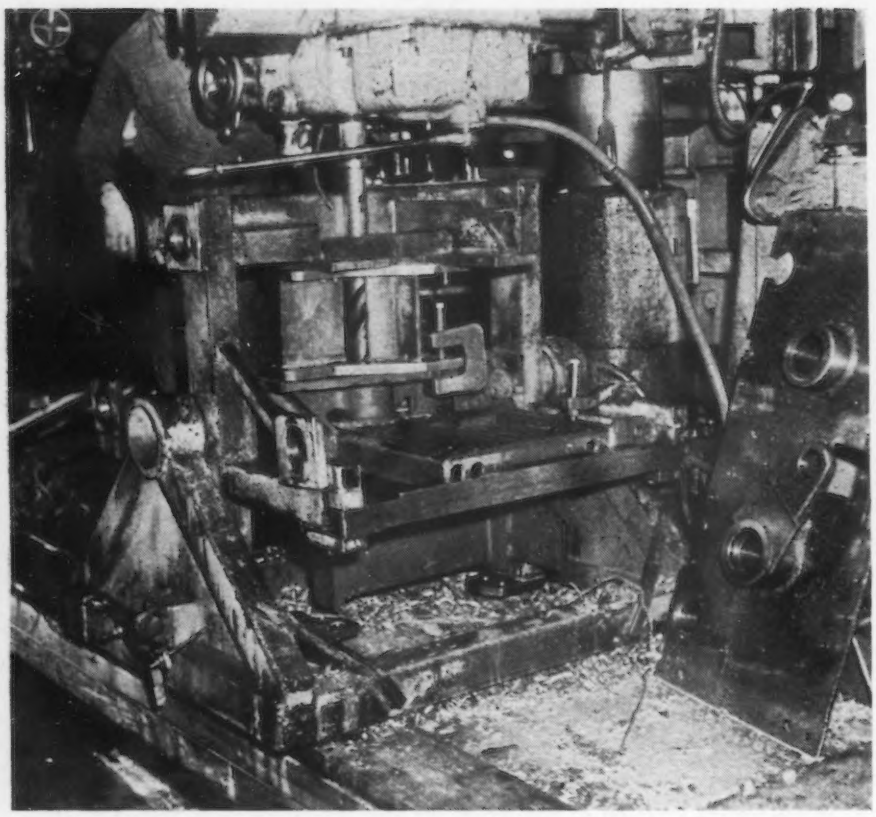

FIG. 10—A roll-over type special welded fixture for machining a power control unit frame gear case and bolt plate structure. This fixture facilitates machining by reducing setup time, layout and handling. Note drilling jig with welded stops and hardened bushings at right.

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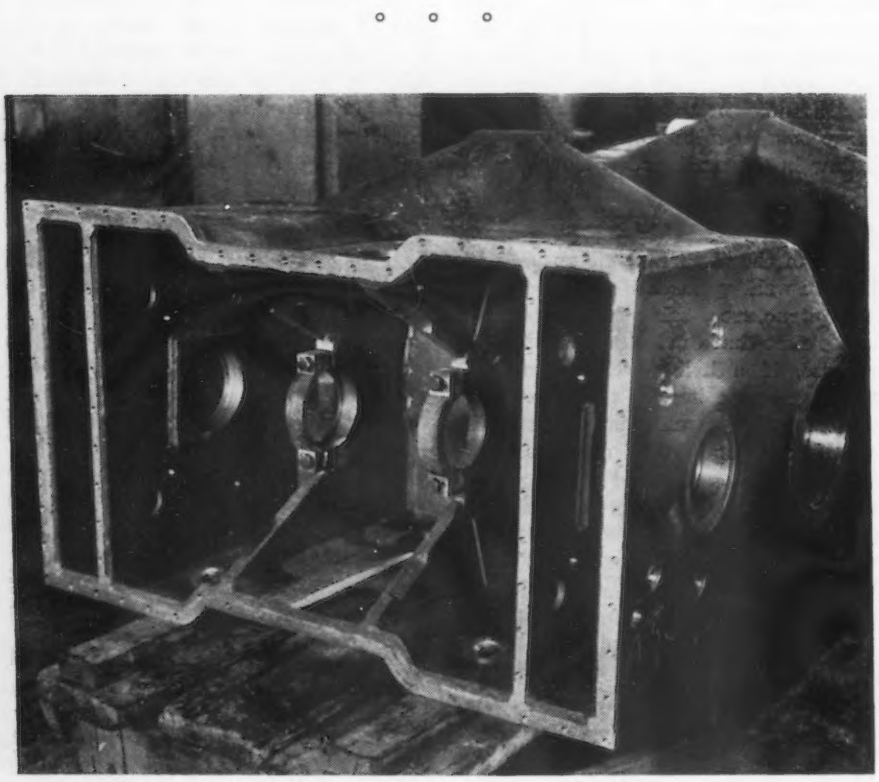

FIG. 11—This 1700 lb. all welded gear case is an example of an arc welded structure which allows close, accurate assembly tolerances to be maintained with a minimum machining upon the case itself. It is normalized prior to machining.

increases the speed with which such parts may be processed in the machine shop. The fact that welded structures almost always have some flat area of rolled plate or some other regular surface which may be used as a reference point against which the stops of a jig on a fixture may rest and locate holes makes the manufacture of such fixtures and jigs by the welded method a relatively easy procedure.

Naturally the complexity of the unit which is being machined determines the type and complexity of the fixture. For the machining of rather complex gear cases, it may be necessary for more than one fixture to be made, while in the machining of a simple lug, bolt plate or bracket, the fixture may be very much simpler.

Fig. 10 shows a rather complex fixture used in machining the main gear case for a cable operating power control unit which mounts on the rear end of a tractor. This radial drill fixture is of the roll-over type, and may be indexed about a horizontal axis so that a variety of drilling, boring and counterboring operations may be done on the case with a minimum of measuring, laying out and handling. At the right of the radial drill column may be seen a drilling fixture employing hardened bushings and welded-on stops.

Large Structures Normalized

A large gear case with a large amount of welding upon it such as is shown in Fig. 11, especially if it involves the use of high tensile alloy steels, should in most cases be stress-relieved or normalized in order to avoid distortion of the machined structure by the release of stresses from removal of metal and in order to avoid hard spots which cause flaws in the machining.

It is not always necessary to normalize gear cases and many other relatively simple structures which are designed in a box-shape and are therefore rather rigid because of their structural shape. Such structures often have welded bearing blocks which confine their stresses to a relatively well-balanced stress within a certain portion of the gear case. In general, whether or not the gear case or welded structure which requires some machining upon it after it has been completed should be normalized or not, depends largely upon the amount of welds upon it, its general shape, the amount of stress which will be placed upon the unit in operation and the heat at which it will operate. If there

were great locked-up stresses on a structure which will operate at a temperature of 200, 300 or 400 deg., those stresses would likely be relieved and might cause misalinement of working parts inside of the case because of changes in the alinement or form of the case itself.

In the example of the large tractor transmission case shown in Fig. 11, because of the close tolerances to which it must be machined, the heat at which it operates, the large amount of welding upon it and the curved design of its body and the fact that there are alloy steels used in the body of the case, it is necessary to normalize the welded case before machining it.

One important source of economy and convenience in the machining or manufacture of such structures as the gear case shown in Fig. 11, is that many parts, such as the heavy bearing blocks upon which the axles of the tractor operate, may be made from low carbon steel which is more easily machinable and less expensive than the alloy steel used in the case. This differential designing, using special materials for special functions in the same structure tends to a better design than can be accomplished in almost any other means of design. It also imparts a degree of convenience in machining which is a great advantage of this type of construction.

Welding Parts to Machined Structures

After a structure, such as a gear case, transmission case or other relatively complex welded structures, has been machined, it is often possible to weld other structural or pre-machined parts to it, or to weld it into a more complex structure, without causing serious distortion or otherwise hindering the function of the finished structure. An example of such welding is shown in Fig. 12, where the highly machined main transmission, Fig. 11, has been unified by arc welding with the combined fuel tanks and motor hanger frame structure (also of arc welded construction) to form a complete assembly.

In this example, the rigidity of the welded case plus its box construction and well-reinforced cross member (inside bearing block) reinforcements make a sufficiently rigid unit so that to weld the major part of the tractor frame to the front side of the case (a process involving approximately 25 ft. of welding on the case itself) still does not draw the case out of shape to the extent that it interferes with the function of the case after a small amount of hand reaming has been done in the final assembly, prior to the installation of the main bearing cups.

The attachment of actuating lugs, reinforcements, mounting supports and a large variety of other features which might be arc welded to welded structures that have been machined, can be done without interference with the function of the unit as long as care is taken to study the effect of the welding. Wherever necessary, the technique of making short intermittent welds and allowing them to cool should be applied to minimize distortion. Another method is to design in such a way that the welds required to fuse the parts to the welded and machined structure balance each other and tend to equalize the stresses. The same effect is frequently obtained in flame hardening by applying the heat to both sides of a long narrow section (such as lathe ways) in order to equalize the distorting effect of the heating and maintain the straightness of the structure.

By fully utilizing the elasticity of design and fabrication afforded by pre-machining of parts and substructures, and of welding additional parts to completely machined weldings, the efficiency and economy of the arc welding method in the production of machinery can be realized.

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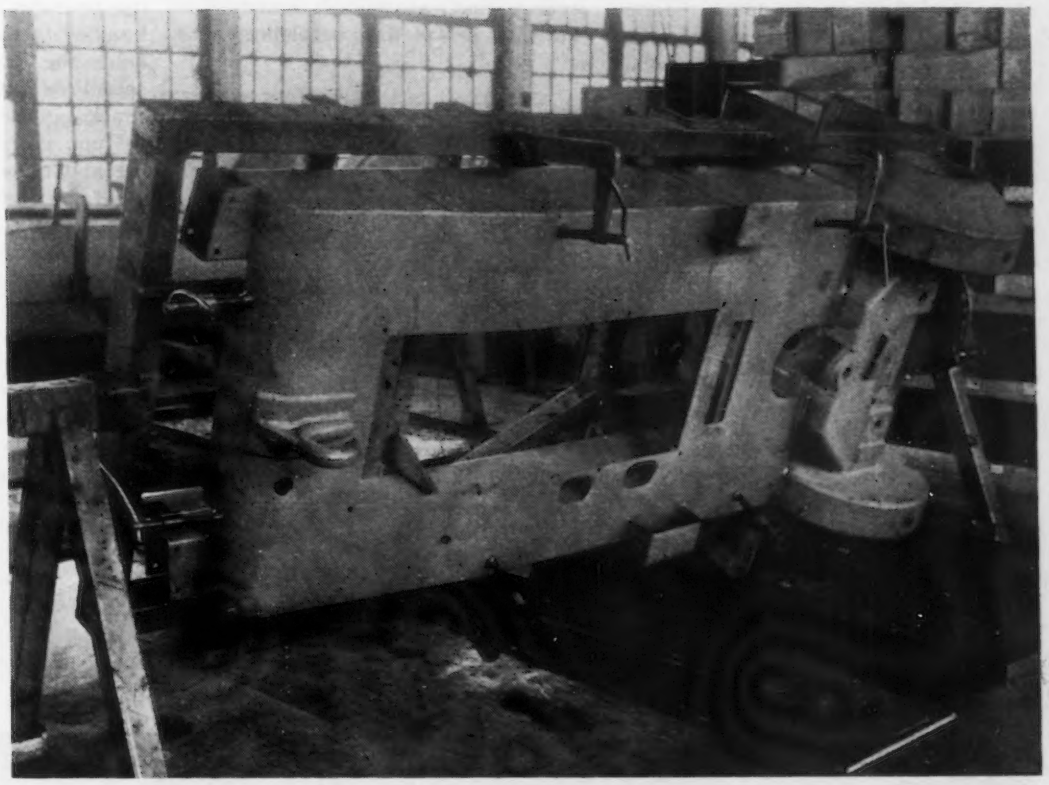

FIG. 12 — When the fuel tank and motor frame structure is set up and welded to the machined gear case (see Fig. 11) in this fixture, the 25 ft. of welding does not seriously stress nor distort the case because of its rigid, box-like design.

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Master Drill Jig for A

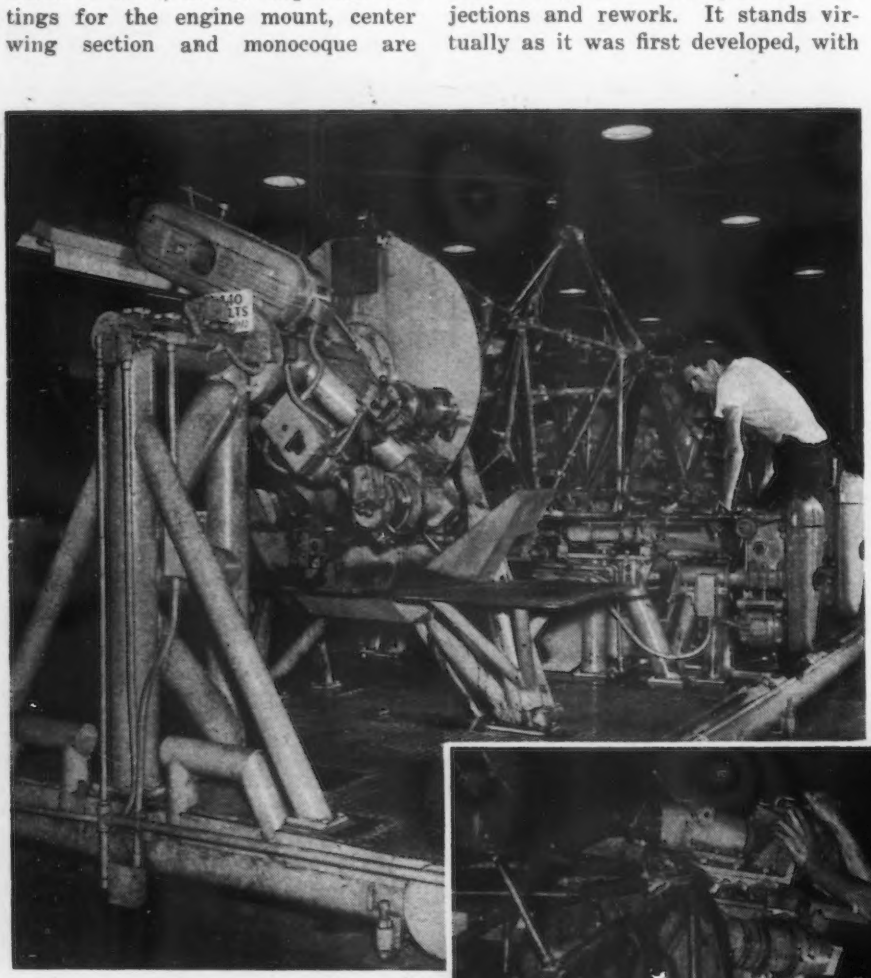
WITH one operator, a master drill jig designed by an employee of Consolidated Vultee Aircraft Corporation's Vultee Field Division plant now accomplishes in 45 min. what formerly required three men and a total of 3 hr. 45 min. to perform. Larry Haggerman designed the machine to accommodate fuselage tube structure for the Valiant basic trainer. In it, all the important fittings for the engine mount, center wing section and monocoque are in turn milled, drilled and reamed.

Haggerman's device has been called a Rube Goldberg contraption, but it takes care of drilling 11 holes, reaming 11 holes, milling 15 surfaces and back spot facing 11 forgings, all to close tolerances. It was in operation at the beginning of 1942, and it is estimated that 16,800 man-hours were saved by it during the year through its whittling down of rejections and rework. It stands virtually as it was first developed, with only minor changes, such as substituting hydraulic for pneumatic power to insure a smoother feed on the mills for the wing fittings.

To accomplish the operation, 12 motor-driven units were adapted to the needs of the jig. Of these, four are standard drill press heads, mounted horizontally at each wing fittings station. These are manually controlled, but are arranged so that one operator, standing between them, handles two at once. A turret head holds the drill and reamer and the spindle is fitted with a quick-change chuck.

Upon the completion of this drilling and reaming operation through 2 in. of steel, two hydraulically actuated straddle mills rise automatically to position and mill the surfaces parallel and to thickness specifications. One motor for the aft fittings, and one for the fore, provide the power for the opposed sides. Thus each motor accomplishes the milling of two sides on the right fitting and two on the left.

Four engine mount and three monocoque forgings are milled, drilled, reamed and back spotfaced by tooling units mounted on the periphery of a freely revolving disk at each end of the jig. These disks are actually turret heads, with smaller turrets attached. The arc through which the tools move lines up with the forgings



ABOVE

FIG. 1—This over-all photo shows master drill jig. In the foreground is one of the turrets for milling, drilling, reaming and back spotfacing four engine mount forgings.

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RIGHT

FIG. 2—Indexing of the turret is done manually, changing the milling tool from one forging to another. The frame contains four forgings on the front end, three on the rear.

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Aircraft Fuselage . . .

so that the necessary stations can be reached simply by rotating the disk.

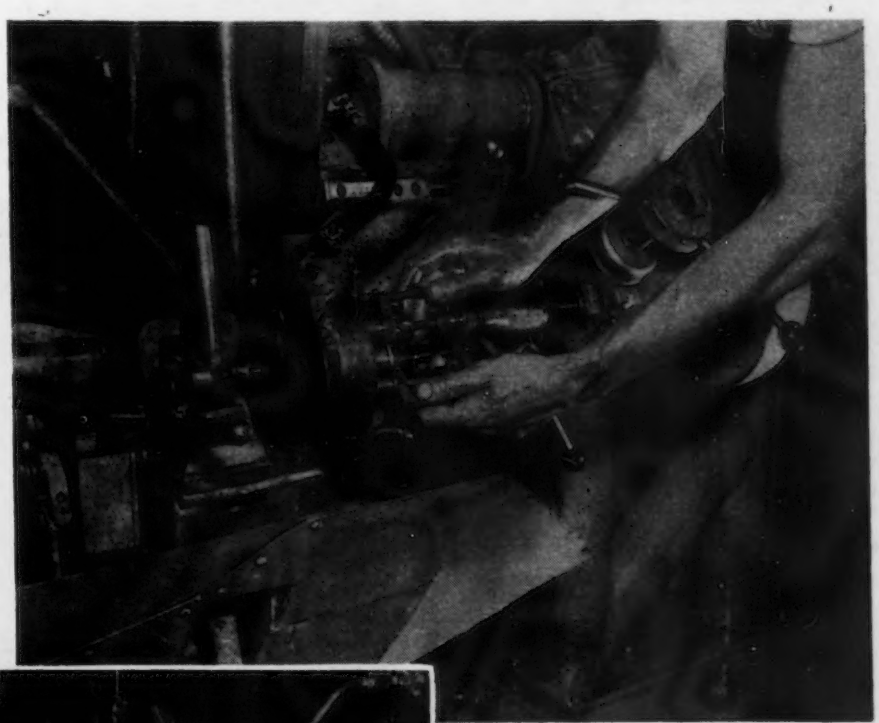
The milling operation on the face of the forging is done automatically with a simple gear and slip clutch arrangement regulating the cutter feed. Due to slight variations in the position of the forgings, an adjusting mechanism was incorporated in the milling unit by means of which a plus or minus adjustment of 0.030 in. is possible. Fittings which cannot be cleaned up to the required 80 per cent, or which are milled below the tolerance, must be reworked by the welding section, involving the setting in of a new forging. The clamping up operation acts to compensate for slighter variations due to weld distortion, with fixtures to make the adjustments fore and aft, and up and down, without the forcing that might throw the holes off tolerance in springback.

As in the case of the wing fittings, tools for the drilling, reaming and back spotfacing of these engine mount and monocoque forgings are mounted in a turret attachment to the rotating disk. The operator indexes the turret, slips on the chuck and regulates the feed with a standard drill press lever.

The jig is open and provides easy access. The tube structure can be fitted in from above or either side, thus facilitating the flow from welding to this station, then through cadmium plating and toward the final assembly line.

A scheduled routine is followed by the operator. First the holes are drilled and reamed on the wing fittings on one side. Then, while the milling on these forgings is being performed automatically, the operator drills and reams the forgings for the engine mount, sets the mills in action on these fittings and proceeds in this manner to complete the circuit of the jig. Five minutes for the drilling and reaming of the wing fittings is the maximum time consumed on any one average operation.

This master drill jig holds to accuracies of 0.008 in., and so rigid is the adherence to specifications that inspection time has been reduced considerably in addition to the 500 per cent decrease in operator time. However, it still takes a full-fledged mechanic to complete the operations.



ABOVE

FIG. 3—Setting tool for drilling engine mount forging at front end of frame. A standard drill head drives the tool turret.

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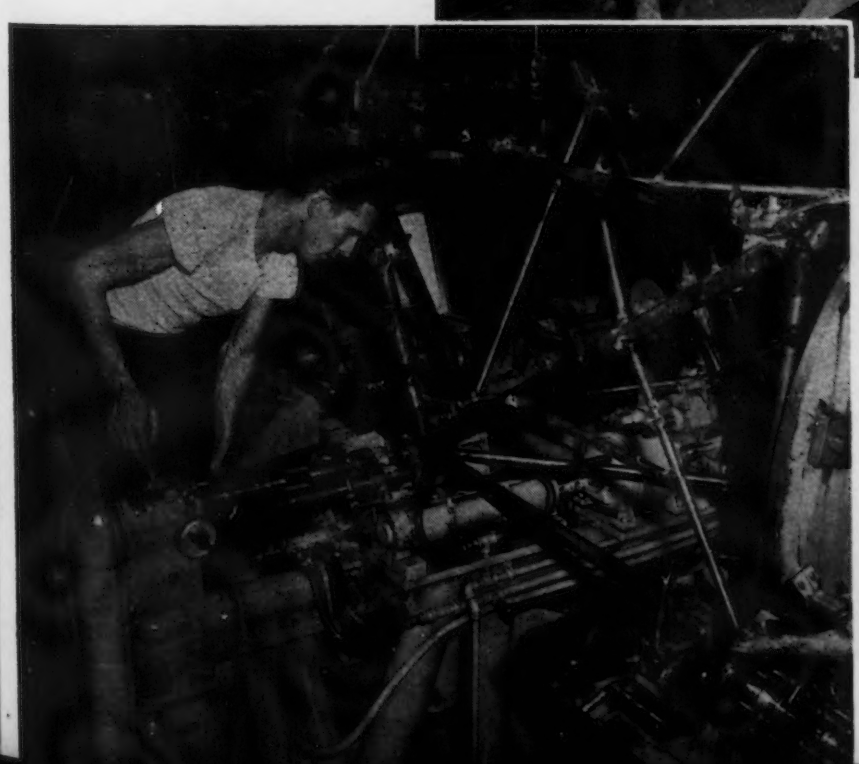

LEFT

FIG. 4—Reaming two wing fittings in one operation. The side turrets of the "Rube Goldberg" hold tools for milling, drilling and reaming the wing fittings. At lower left is tool turret for machining monocoque fitting.

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Drying Impregnated Castings

With Infra-Red Rays

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By S. H. BRAMS
Detroit Editor, THE IRON AGE

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A CHAIN of circumstances which began more than a decade ago, growing in part out of the location of a Ford factory hospital has resulted today in speeding and improving the drying of water-glass employed to impregnate castings in the aluminum foundry of Lincoln Motor division.

Experiments seeking quick drying of synthetic resins at Ford in 1932 were crowned with success when a technician, noting the use of infra-red lamps in the hospital department adjoining his laboratory, borrowed one such lamp for research work. The result was the uncovering of the fact that infra-red ray drying was not only quicker but also started from the resin layer nearest the metal and worked out to the surface, thereby producing a more satisfactory job. Subsequently, batteries of infra-red lamps were installed to speed the drying of paint on Ford automobile bodies. Now this principle has been extended to the drying of impregnating material used in both aluminum and magnesium castings, the former manufactured at Lincoln, and the latter coming from the magnesium foundry at River Rouge.

The battery of infra-red lamps is set up in a semi-elliptical tunnel 42 ft. long, approximately 5 ft. high and about 3½ ft. wide. There are 686 lamps in the set-up, the lower six tiers built up with reflectors of 10-in. diameter. The upper tier on each side is made up of smaller units, due simply to space limitations. Both the aluminum and the magnesium castings are handled alike. Sand having been blown out, they are washed in a solution of trisodium phosphate, two ounces per gallon of hot water. Transfer is then made to a rinse of hot water which is held at about 190 deg. F. This cleans the castings thoroughly and pre-heats them before they are placed in the autoclave.

Castings are held in the autoclave for 30 min. in a vacuum ranging from 22 to 25 in. Water-glass solution is then pumped in, and the pieces are held under 90 to 100 lb. pressure for one hour. After removal, the castings are rinsed in hot water and taken to the conveyor line which feeds them into the infra-red lamp tunnel.

The castings hang on the conveyor line for approximately an hour before entering the infra-red bank, permitting them to air dry. They then pass through the baking battery in about 2 hr., the temperature being 255 deg. F. in the center and about 250 deg. F. at the ends. This bake "sets" the water-glass in any pores which may exist. Customary baking in a furnace, requiring a longer time cycle, is eliminated. In view of this elimination, purchase of furnace equpment in the new foundry was unnecessary.

In summary, water-glass which has been forced into any pores which exist in the castings is dried into place by the baking. Impregnation of all castings in this manner is better insurance than impregnation of only the castings found porous.

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VIEW into the infra-red lamp bank which dries water-glass used to impregnate castings at the Lincoln aluminum foundry of Ford Motor Co.

Steel Hardness Conversion Tables . . .

CONVERSION tables giving data on the relationship among diamond pyramid hardness, Rockwell hardness, Superficial Rockwell hardness and Brinell hardness of steel, recently presented by the American Society for Testing Materials, are reproduced here. The tables are based on extensive tests on carbon and alloy steels, mostly in the heat-treated condition, but have been found to be reliable on practically all constructional alloy steels and tool steels in the asforged, annealed, normalized, and quenched and tempered conditions, provided they are homogeneous. Such special cases as high-manganese steel, 18 per cent chromium, 8 per cent nickel steel, and other austenitic steels, nickel-base alloys as well as constructional alloy steels and tool steels in the cold-worked condition, may not conform to these relationships with the same degree of accuracy as the steels for which they are intended.

For table on hardness conversion of cartridge brass, see THE IRON AGE, *May* 21, 1942.

Diamond pyramid hardness is determined by forcing a square base diamond pyramid having an apex angle of 136 deg. into the specimen under loads usually of 5 to 50 kg., and measuring the diagonals of the recovered indentations. The diamond pyramid hardness is defined as the load per unit area of surface contact in kilograms per square millimeter, as calculated from the average diagonal, as follows:

$$\text{D.P.H.} = \frac{2L \sin \frac{a}{2}}{d^2}$$

where:

D.P.H. = diamond pyramid hardness,
d = length of average diagonal in millimeters,
a = apex angle = 136 deg., and
L = load in kilograms.

Rockwell and Rockwell Superficial

TABLE I

Hardness Conversion Numbers For Steel

Diamond Pyramid Hardness Number	Brinell Hardness Number: 10-mm Standard Ball, 3000-kg. Load	Brinell Hardness Number: 10-mm. Hultgren Ball, 3000-kg. Load	Brinell Hardness Number: 10-mm. Carbide Ball, 3000-kg. Load	Rockwell Hardness Number: C Scale, 150-kg. Load, Brale Penetrator	Rockwell Hardness Number: A Scale, 60-kg. Load, Brale Penetrator	Rockwell Hardness Number: D Scale, 100-kg. Load, Brale Penetrator	Rockwell Superficial Hardness Number: 15-N Scale, 15-kg. Load, Superficial Brale Penetrator	Rockwell Superficial Hardness Number: 30-N Scale, 30-kg. Load, Superficial Brale Penetrator	Rockwell Superficial Hardness Number: 45-N Scale, 45-kg. Load, Superficial Brale Penetrator	Diamond Pyramid Hardness Number
940	*	...	...	68.0	85.6	76.9	93.2	84.4	75.4	940
920	*	...	...	67.5	85.3	76.5	93.0	84.0	74.8	920
900	*	...	...	67.0	85.0	76.1	92.9	83.6	74.2	900
880	*	...	...	66.4	84.7	75.7	92.7	83.1	73.6	880
860	*	...	...	65.9	84.4	75.3	92.5	82.7	73.1	860
840	*	...	745	65.3	84.1	74.8	92.3	82.2	72.2	840
820	*	..	733	64.7	83.8	74.3	92.1	81.7	71.8	820
800	*	...	722	64.0	83.4	73.8	91.8	81.1	71.0	800
780	*	...	710	63.3	83.0	73.3	91.5	80.4	70.2	780
760	*	...	698	62.5	82.6	72.6	91.2	79.7	69.4	760
740	*	...	684	61.8	82.2	72.1	91.0	79.1	68.6	740
720	*	...	670	61.0	81.8	71.5	90.7	78.4	67.7	720
700	*	615	656	60.1	81.3	70.8	90.3	77.6	66.7	700
690	*	610	647	59.7	81.1	70.5	90.1	77.2	66.2	690
680	*	603	638	59.2	80.8	70.1	89.8	76.8	65.7	680
670	*	597	630	58.8	80.6	69.8	89.7	76.4	65.3	670
660	*	590	620	58.3	80.3	69.4	89.5	75.9	64.7	660
650	*	585	611	57.8	80.0	69.0	89.2	75.5	64.1	650
640	*	578	601	57.3	79.8	68.7	89.0	75.1	63.5	640
630	*	571	591	56.8	79.5	68.3	88.8	74.6	63.0	630
620	*	564	582	56.3	79.2	67.9	88.5	74.2	62.4	620
610	*	557	573	55.7	78.9	67.5	88.2	73.6	61.7	610
600	*	550	564	55.2	79.6	67.0	88.0	73.2	61.2	600
590	*	542	554	54.7	78.4	66.7	87.8	72.7	60.5	590
580	*	535	545	54.1	78.0	66.2	87.5	72.1	59.9	580
570	*	527	535	53.6	77.8	65.8	87.2	71.7	59.3	570
560	*	519	525	53.0	77.4	65.4	86.9	71.2	58.6	560
550	505	512	517	52.3	77.0	64.8	86.6	70.5	57.8	550
540	496	503	507	51.7	76.7	64.4	86.3	70.0	57.0	540
530	488	495	497	51.1	76.4	63.9	86.0	69.5	56.2	530
520	480	487	488	50.5	76.1	63.5	85.7	69.0	55.6	520
510	473	479	479	49.8	75.7	62.9	85.4	68.3	54.7	510
500	465	471	471	49.1	75.3	62.2	85.0	67.7	53.9	500
490	456	460	460	48.4	74.9	61.6	84.7	67.1	53.1	490
480	448	452	452	47.7	74.5	61.3	84.3	66.4	52.2	480
470	441	442	442	46.9	74.1	60.7	83.9	65.7	51.3	470
460	433	433	433	46.1	73.6	60.1	83.6	64.9	50.4	460
450	425	425	425	45.3	73.3	59.4	83.2	64.3	49.4	450
440	415	415	415	44.5	72.8	58.8	82.8	63.5	48.4	440
430	405	405	405	43.6	72.3	58.2	82.3	62.7	47.4	430
420	397	397	397	42.7	71.8	57.5	81.8	61.9	46.4	420
410	388	388	388	41.8	71.4	56.8	81.4	61.1	45.3	410
400	379	379	379	40.8	70.8	56.0	80.9	60.2	44.1	400
390	369	369	369	39.8	70.3	55.2	80.3	59.3	42.9	390
380	360	360	360	38.8	69.8	54.4	79.8	58.4	41.7	380
370	350	350	350	37.7	69.2	53.6	79.2	57.4	40.4	370
360	341	341	341	36.6	68.7	52.8	78.6	56.4	39.1	360
350	331	331	331	35.5	68.1	51.9	78.0	55.4	37.8	350
340	322	322	322	34.4	67.6	51.1	77.4	54.4	36.5	340
330	313	313	313	33.3	67.0	50.2	76.8	53.6	35.2	330
320	303	303	303	32.2	66.4	49.4	76.2	52.3	33.9	320
310	294	294	294	31.0	65.8	48.4	75.6	51.3	32.5	310
300	284	284	284	29.8	65.2	47.5	74.9	50.2	31.1	300
295	280	280	280	29.2	64.8	47.1	74.6	49.7	30.4	295
290	275	275	275	28.5	64.5	46.5	74.2	49.0	29.5	290
285	270	270	270	27.8	64.2	46.0	73.8	48.4	28.7	285
280	265	265	265	27.1	63.8	45.3	73.4	47.8	27.9	280
275	261	261	261	26.4	63.5	44.9	73.0	47.2	27.1	275
270	256	256	256	25.6	63.1	44.3	72.6	46.4	26.2	270
265	252	252	252	24.8	62.7	43.7	72.1	45.7	25.2	265
260	247	247	247	24.0	62.4	43.1	71.6	45.0	24.3	260
255	243	243	243	23.1	62.0	42.2	71.1	44.2	23.2	255
250	238	238	238	22.2	61.6	41.7	70.6	43.4	22.2	250
245	233	233	233	21.3	61.2	41.1	70.1	42.5	21.1	245
240	228	228	228	20.3	60.7	40.3	69.6	41.7	19.9	240

*No Brinell hardness values are given above 500 Brinell hardness number for the 10-mm. standard steel ball in conformance with limitations established by the Standard Method of Test for Brinell Hardness of Metallic Materials, A.S.T.M. Designation E 10.

TABLE II

Hardness Conversion Numbers For Steel

Rockwell C Hardness Number	Diamond Pyramid Hardness Number	Brinell Hardness Number: 10-mm. Standard Ball, 3000-kg. Load	Brinell Hardness Number: 10-mm. Hultgren Ball, 3000-kg. Load	Brinell Hardness Number: 10-mm. Carbide Ball, 3000-kg. Load	Rockwell Hardness Number: A Scale, 60-kg. Load, Brale Penetrator	Rockwell Hardness Number: D Scale, 100-kg. Load, Brale Penetrator	Rockwell Superficial Hardness Number: 15-N Scale, 15-kg. Load, Superficial Brale Penetrator	Rockwell Superficial Hardness Number: 30-N Scale, 30-kg. Load, Superficial Brale Penetrator	Rockwell Superficial Hardness Number: 45-N Scale, 45-kg. Load, Superficial Brale Penetrator	Rockwell C Hardness Number
68	940	*	...	...	85.6	76.9	93.2	84.4	75.4	68
67	900	*	...	...	85.0	76.1	92.9	83.6	74.2	67
66	865	*	...	...	84.5	75.4	92.5	82.8	73.3	66
65	832	*	...	739	83.9	74.5	92.2	81.9	72.0	65
64	800	*	...	722	83.4	73.8	91.8	81.1	71.0	64
63	772	*	...	705	82.8	73.0	91.4	80.1	69.9	63
62	746	*	...	688	82.3	72.2	91.1	79.3	68.8	62
61	720	*	...	670	81.8	71.5	90.7	78.4	67.7	61
60	697	*	613	654	81.2	70.7	90.2	77.5	66.6	60
59	674	*	599	634	80.7	69.9	89.8	76.6	65.5	59
58	653	*	587	615	80.1	69.2	89.3	75.7	64.3	58
57	633	*	575	595	79.6	68.5	88.9	74.8	63.2	57
56	613	*	561	577	79.0	67.7	88.3	73.9	62.0	56
55	595	*	546	560	78.5	66.9	87.9	73.0	60.9	55
54	577	*	534	543	78.0	66.1	87.4	72.0	59.8	54
53	560	*	519	525	77.4	65.4	86.9	71.2	58.6	53
52	544	500	508	512	76.8	64.6	86.4	70.2	57.4	52
51	528	487	494	496	76.3	63.8	85.9	69.4	56.1	51
50	513	475	481	481	75.9	63.1	85.5	68.5	55.0	50
49	498	464	469	469	75.2	62.1	85.0	67.6	53.8	49
48	484	451	455	455	74.7	61.4	84.5	66.7	52.5	48
47	471	442	443	443	74.1	60.8	83.9	65.8	51.4	47
46	458	432	432	432	73.6	60.0	83.5	64.8	50.3	46
45	446	421	421	421	73.1	59.2	83.0	64.0	49.0	45
44	434	409	409	409	72.5	58.5	82.5	63.1	47.8	44
43	423	400	400	400	72.0	57.7	82.0	62.2	46.7	43
42	412	390	390	390	71.5	56.9	81.5	61.3	45.5	42
41	402	381	381	381	70.9	56.2	80.9	60.4	44.3	41
40	392	371	371	371	70.4	55.4	80.4	59.5	43.1	40
39	382	362	362	362	69.9	54.6	79.9	58.6	41.9	39
38	372	353	353	353	69.4	53.8	79.4	57.7	40.8	38
37	363	344	344	344	68.9	53.1	78.8	56.8	39.6	37
36	354	336	336	336	68.4	52.3	78.3	55.9	38.4	36
35	345	327	327	327	67.9	51.5	77.7	55.0	37.2	35
34	336	319	319	319	67.4	50.8	77.2	54.2	36.1	34
33	327	311	311	311	66.8	50.0	76.6	53.3	34.9	33
32	318	301	301	301	66.3	49.2	76.1	52.1	33.7	32
31	310	294	294	294	65.8	48.4	75.6	51.3	32.5	31
30	302	286	286	286	65.3	47.7	75.0	50.4	31.3	30
29	294	279	279	279	64.7	47.0	74.5	49.5	30.1	29
28	286	271	271	271	64.3	46.1	73.9	48.6	28.9	28
27	279	264	264	264	63.8	45.2	73.3	47.7	27.8	27
26	272	258	258	258	63.3	44.6	72.8	46.8	26.7	26
25	266	253	253	253	62.8	43.8	72.2	45.9	25.5	25
24	260	247	247	247	62.4	43.1	71.6	45.0	24.3	24
23	254	243	243	243	62.0	42.1	71.0	44.0	23.1	23
22	248	237	237	237	61.5	41.6	70.5	43.2	22.0	22
21	243	231	231	231	61.0	40.9	69.9	42.3	20.7	21
20	238	226	226	226	60.5	40.1	69.4	41.5	19.6	20

*No Brinell hardness values are given above 500 Brinell hardness number for the 10-mm. standard steel ball in conformance with limitations established by the Standard Method of Test for Brinell Hardness of Metallic Materials, A.S.T.M. Designation E 10.

hardness are determined in accordance with the standard methods of test of metallic materials, A.S.T.M. designation E 18. Brinell hardness is covered by A.S.T.M. designation E 10.

The values given in Table I to III are recommended for use in converting the results of one form of hardness test to another, only on flat surfaces and only when the specific test procedures and precautions outlined in the several hardness test methods are followed.

Attention is called to the limitation of use of the standard steel ball to hardness under 500 Brinell. The Rockwell Superficial hardness and diamond pyramid hardness tests require especially smooth surfaces for accurate results. In all tests the specimen should be of sufficient thickness to avoid anvil effect, which thickness is roughly ten times the depth of the indentation.

It is very important that conversions from Brinell hardness to shallow impression-type tests, such as Rockwell Superficial and diamond pyramid hardness tests, be made only on materials that are of uniform hardness to a depth at least 10 times that of the indentation. Such hardness conversions should not be made on surface-hardened, coated, or decarburized surfaces.

Although the Rockwell hardness and Rockwell Superficial hardness values in the tables are given to tenths of a point in order to maintain exact relationships between the various scales, it is customary to report these values to the nearest point.

Experience has shown that even under carefully controlled conditions, some deviations from the conversion relationships will occur.

Soap in Industrial Lubricants

USED as a lubricant, soap is assisting in the production of shell and cartridge cases, barbed wire, cables, springs and cold drawn bars, wires and steel blanks of every kind. In fact, most of the metal that is cold-fabricated for war utilizes soap at some stage in its manufacture, according to Roscoe C. Edlund, manager, Association of American Soap and Glycerine Producers, Inc.

Reduces Friction in Metal Drawing

In drawing wire, there is friction of approximately 18,000 to 30,000 lb. per sq. in. within the die, which must be reduced by various methods of lubrication. Soap is almost universally used for this purpose because it is clean, easy to handle, concentrated and more easily adaptable to a wide variety of conditions. Dry drawing calls for powdered soap of 88 to 92 per cent anhydrous soap content. Wet drawing uses flake and powdered soaps as well as soft soaps. These are used in conjunction with other substances, depending upon local practices and conditions.

In dry drawing, the powdered soap is made generally from a tallow, although when available palm oil and a combination of palm oil and tallow are used. In wet drawing, the wire and die are either submerged under a soap solution in water or the soap solution drips over the die and wire while drawing. The purpose is to reduce the friction between the moving wire and the die surface, to lessen the force required to pull the wire through, to reduce the wear on the die and to give a smoother finish.

For fine wire, that is, sizes up to about 0.010 in., a mixture of soap and water is used, about 9 lb. of soap

TABLE III

Hardness Conversion Numbers For Steel

Brinell Indentation Diameter, mm.	Brinell Hardness Number: 10-mm. Standard Ball, 3000-kg. Load	Brinell Hardness Number: *10-mm. Hultgran Ball, 3000-kg. Load	Brinell Hardness Number: 10-mm. Carbide Ball, 3000-kg. Load	Diamond Pyramid Hardness Number	Rockwell Hardness Number: C Scale, 150-kg. Load, Brale Penetrator	Rockwell Hardness Number: A Scale, 60-kg. Load, Brale Penetrator	Rockwell Hardness Number: D Scale, 100-kg. Load, Brale Penetrator	Rockwell Superficial Hardness Number: 15-N Scale, 15-kg. Load, Superficial Brale Penetrator	Rockwell Superficial Hardness Number: 30-N Scale, 30-kg. Load, Superficial Brale Penetrator	Rockwell Superficial Hardness Number: 45-N Scale, 45-kg. Load, Superficial Brale Penetrator	Brinell Indentation Diameter, mm.
2.35	*	...	682	737	61.7	82.2	72.0	91.0	79.0	68.5	2.35
2.40	*	...	653	697	60.0	81.2	70.7	90.2	77.5	66.5	2.40
2.45	*	...	627	667	58.7	80.5	69.7	89.6	76.3	65.1	2.45
2.50	*	601	...	677	59.1	80.7	70.0	89.8	76.8	65.7	2.50
	...	...	601	640	57.3	79.8	68.7	89.0	75.1	63.5	
2.55	*	578	...	640	57.3	79.8	68.7	89.0	75.1	63.5	2.55
	...	...	578	615	56.0	79.1	67.7	88.4	73.9	62.1	
2.60	*	555	...	607	55.6	78.8	67.4	88.1	73.5	61.8	2.60
	...	...	555	591	54.7	78.4	66.7	87.8	72.7	60.6	
2.65	*	534	...	579	54.0	78.0	66.1	87.5	72.0	59.8	2.65
	...	...	534	569	53.5	77.8	65.8	87.2	71.6	59.2	
2.70	*	514	...	553	52.5	77.1	65.0	86.7	70.7	58.0	2.70
	...	...	514	547	52.1	76.9	64.7	86.5	70.3	57.6	
2.75	495	495	...	539	51.6	76.7	64.3	86.3	69.9	56.9	2.75
	...	...	495	530	51.1	76.4	63.9	86.0	69.5	56.2	
	...	...	...	528	51.0	76.3	63.8	85.9	69.4	56.1	
2.80	477	477	...	516	50.3	75.9	63.2	85.6	68.7	55.2	2.80
	...	...	477	508	49.6	75.6	62.7	85.3	68.2	54.5	
	...	...	...	508	49.6	75.6	62.7	85.3	68.2	54.5	
2.85	461	461	...	495	48.8	75.1	61.9	84.9	67.4	53.5	2.85
	...	...	461	491	48.5	74.9	61.7	84.7	67.2	53.2	
	...	...	...	491	48.5	74.9	61.7	84.7	67.2	53.2	
2.90	444	444	...	474	47.2	74.3	61.0	84.1	66.0	51.7	2.90
	...	...	444	472	47.1	74.2	60.8	84.0	65.8	51.5	
	...	...	...	472	47.1	74.2	60.8	84.0	65.8	51.5	
2.95	429	429	429	455	45.7	73.4	59.7	83.4	64.6	49.9	2.95
3.00	415	415	415	440	44.5	72.8	58.8	82.8	63.5	48.4	3.00
3.05	401	401	401	425	43.1	72.0	57.8	82.0	62.3	46.9	3.05
3.10	388	388	388	410	41.8	71.4	56.8	81.4	61.1	45.3	3.10
3.15	375	375	375	396	40.4	70.6	55.7	80.6	59.9	43.6	3.15
3.20	363	363	363	383	39.1	70.0	54.6	80.0	58.7	42.0	3.20
3.25	352	352	352	372	37.9	69.3	53.8	79.3	57.6	40.5	3.25
3.30	341	341	341	360	36.6	68.7	52.8	78.6	56.4	39.1	3.30
3.35	331	331	331	350	35.5	68.1	51.9	78.0	55.4	37.8	3.35
3.40	321	321	321	339	34.3	67.5	51.0	77.3	54.3	36.4	3.40
3.45	311	311	311	328	33.1	66.9	50.0	76.7	53.3	34.4	3.45
3.50	302	302	302	319	32.1	66.3	49.3	76.1	52.2	33.8	3.50
3.55	293	293	293	309	30.9	65.7	48.3	75.5	51.2	32.4	3.55
3.60	285	285	285	301	29.9	65.3	47.6	75.0	50.3	31.2	3.60
3.65	277	277	277	292	28.8	64.6	46.7	74.4	49.3	29.9	3.65
3.70	269	269	269	284	27.6	64.1	45.9	73.7	48.3	28.5	3.70
3.75	262	262	262	276	26.6	63.6	45.0	73.1	47.3	27.3	3.75
3.80	255	255	255	269	25.4	63.0	44.2	72.5	46.2	26.0	3.80
3.85	248	248	248	261	24.2	62.5	43.2	71.7	45.1	24.5	3.85
3.90	241	241	241	253	22.8	61.8	42.0	70.9	43.9	22.8	3.90
3.95	235	235	235	247	21.7	61.4	41.4	70.3	42.9	21.5	3.95
4.00	229	229	229	241	20.5	60.8	40.5	69.7	41.9	20.1	4.00

*No Brinell hardness values are given above 500 Brinell hardness number for the 10-mm. standard steel ball in conformance with limitations established by the Standard Method of Test for Brinell Hardness of Metallic Materials, A.S.T.M. Designation E 10.

to 100 gal. of water. Intermediate sizes use a mixture of about 50 lb. of soap and 50 lb. of grease or tallow to 500 gal. of water. Heavy wire drawing uses 300 lb. of grease or tallow to 500 gal. of water. In this process the soap together with the tallow or grease is boiled thoroughly for an hour in about 250 gal. of water, after which the balance of water (250 gal.) is added.

This use of soap touches so many different types of metal working that it is impossible to present accurate statistics covering the entire field. A partial estimate can be based upon the figures of the American Iron and Steel Institute, which reports that during the calendar year 1942, the total production of cold drawn steel bars was 1,963,445 tons and of drawn wire 3,679,646 tons. Since a ton of this type of production averages at least 2 lb. of soap, it is evident that more than 11,000,000 lb. of soap is now being used annually for this purpose.

Cartridge Case Drawing

Some of the big brass companies, now almost entirely converted to the manufacture of war goods, report to the Copper and Brass Research Association that in the manufacture of shell and cartridge cases soap is indispensable. In describing this use of soap one company says:

"The cases are sprayed or dipped in a soap solution after which they are passed through a drying oven, from which they emerge with a thin film of dry soap on the surface. This soap film lubricates them as they pass through the die in the following drawing operation. Wet soap solutions are also used in some cases. There are also certain wire drawing operations which we perform in which the wire passes through a bed of dry soap powder and picks up enough to lubricate it passing through the die.

"Several grades of drawing compounds which have a certain soap content and which are very important in various drawing operations of brass and bronze rod, also copper tube are also used in the same mill.

"It is absolutely necessary to use a lubricant of some nature for these purposes, and compounds containing a soap content are preferable to other types of oil and greases, because during the operation of drawing rods and tubes it is necessary to preheat them in furnaces for annealing, etc., and other grades of oil and greases are inclined to surface coat the rod, whereas with soap-type drawing compounds this difficulty does not occur."

Improves Oil Film Strength

Soap is a vital component of a large number of new greases with which technicians are meeting new production problems. The addition of soap produces a grease which will not leak away from points of friction and which adheres to rotating surfaces better than straight oil. These new lubricants are especially useful in pumps and carburetor valves that come in contact with gasoline which quickly dissolves ordinary greases.

Soap is also used in cutting oils as an emulsifying and stabilizing agent. It improves the stability of the oil emulsion and increases its film strength.

. . . Gage In

By C. H. BORNEMAN

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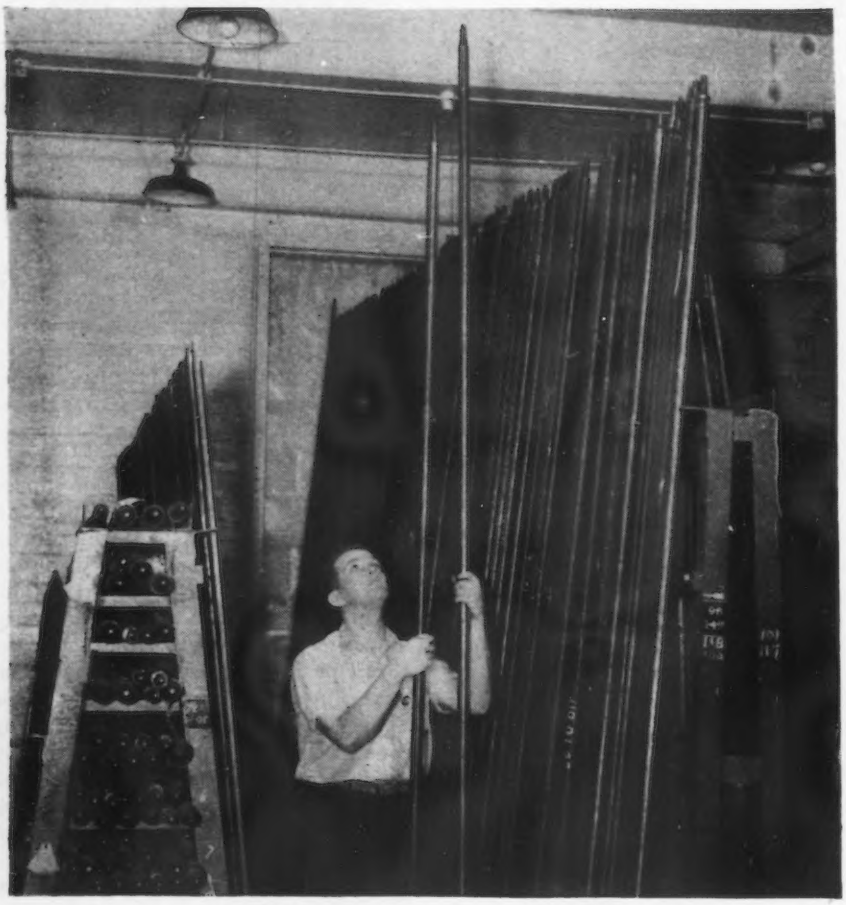

Fig. 1—Stocks of needle gages used for large bores.

SOME of the divisions of the Schenectady Works of the General Electric Co. are engaged in mass production work; others make a wide variety of products, some of which are "tailor-made" to the purchaser's individual requirements. Each type of production calls for gaging equipment best suited for the purpose.

The departments making only one, or at most a few, of the same products at a given time, for example, use commercial measuring instruments whenever practical. These instruments include inside and outside micrometers, vernier calipers, vernier and micrometer depth gages, etc. On the other hand, because of the great loss which would be entailed if a large piece of apparatus were defective as a result of a micrometer or a vernier caliper being misread, it has been the practice to use fixed gages on such apparatus for determining bore diameters, outside diameters and lengths, even though the desired gage is not in stock and must be made up. Through the years, a large number of such gages has been accumulated.

Tool steel pin or needle gages, Fig. 1, are used for bores ranging up to many feet in diameter. These are roughed out in one of the tool rooms and finished to size in the gage inspection room. Large forged snap gages are used for outside diameters. "Drop gages"—fixed length gages with snap gage jaws—are used for lengths between shoulders and for outside diameters which can be measured across the end of the work, such as vertical boring mill work.

These fixed gages, used on tailor-made jobs, are returned to the tool crib as soon as a given job is done, or at least every two weeks when their use extends over that period. Upon being returned to the tool crib, they are placed in a small gage conveyance and taken to the central gage inspection room in the plant. They attain the gage room temperature during the night and are inspected early the next morning. If one of the gages is found to be outside the permitted tolerance, the matter is im-

FIG. 2—Master pin gages, placed end to end, in a horizontal measuring machine. Gages up to 280 in. in length can be checked on this instrument.

Inspection Methods . . .

. . . At the Schenectady Works, the design, procurement, inspection and care of gages is centralized under one organization, known as Tool and Gage Service, which has very complete facilities for carrying out these functions. Because of the wide variety and size of products made here, many of the gages devised are out of the ordinary and the methods of checking these gages differ from those used in the average gage laboratory.

mediately called to the attention of the interested supervisors so that they can determine whether any defective work has been produced because of the error in the gage. However, instances in which such gage discrepancies occur are extremely few.

Pin or needle gages are re-inspected in a gage inspection fixture by comparison with fixed standard needle gages. These standards are grouped on a rack close to the gage inspection fixture. New pin or needle gages, when being brought to size, on the other hand, are measured in a horizontal measuring machine.

An 80-in. horizontal measuring machine has been provided with an Electrolimit tailstock of a special design. The high amplification of this instrument makes it possible to take measurements to an accuracy of a few millionths of an inch. Its amplification is so high that expansion due to temperature differences between the work and the machine are easily noticeable. To illustrate the thermal sensitivity of this machine, a hollow pin gage can be positioned in the machine and the machine adjusted so that with both machine and work at the same temperature, the indicator reads zero. If a hand is wrapped around this hollow pin gage, the instrument pointer will almost instantly start to move and will continue to move until the hand is removed. In 1 min. the expansion will be as much as 0.0002-in.

A long measuring machine is used for measuring long pin gages up to 280 in. in length. This machine does not have a graduated bar. Master pin gages, measured in the 80-in. horizontal measuring machine are used for setting this machine. They are placed end to end, as shown in Fig. 2.

Large snap gages are inspected with gage blocks, standard needle gages or large inside micrometers, depending on the availability of gage blocks or a fixed standard pin gage of the required size.

Circumferential Length Tapes

For large outside diameters, usually sizes from 30 in. up, circumferential fixed length tapes are used. These tapes are made to such a length that the ends just touch when the tape is is wrapped around a piece of work of the right diameter at the required tension. The tapes are brought to size and inspected on a tape measuring machine, as shown in Fig. 3. The tape is looped around the two disks which have been spaced the right distance by inserting gage blocks or a pin gage and gage blocks between them. The tape is adjusted to the right tension with the tension device shown in Fig. 4. This device also applies the same testing tension to the tape while the tape is wrapped around the work. On the tape measuring machine the ends of the tape are filed until they just meet when at the proper tension. A line is scribed exactly ¼ in. back from each end of the tape so as to preclude tampering with its length outside the gage service department.

To determine the space between the two disks of the tape measuring

Fig. 3—Measuring machine for sizing circumferential tapes for gaging large diameters.

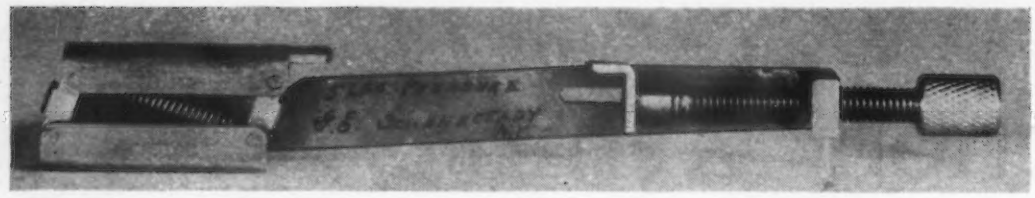

FIG. 4—A tape tension device used for both checking the tape length and the work circumference. See Fig. 3 also.

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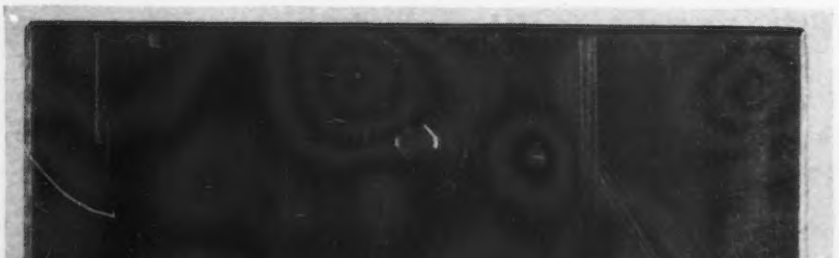

FIG. 5—A hole location gage involving diamond shaped pins. This is used where the tolerances are different in one coordinate direction than in the other.

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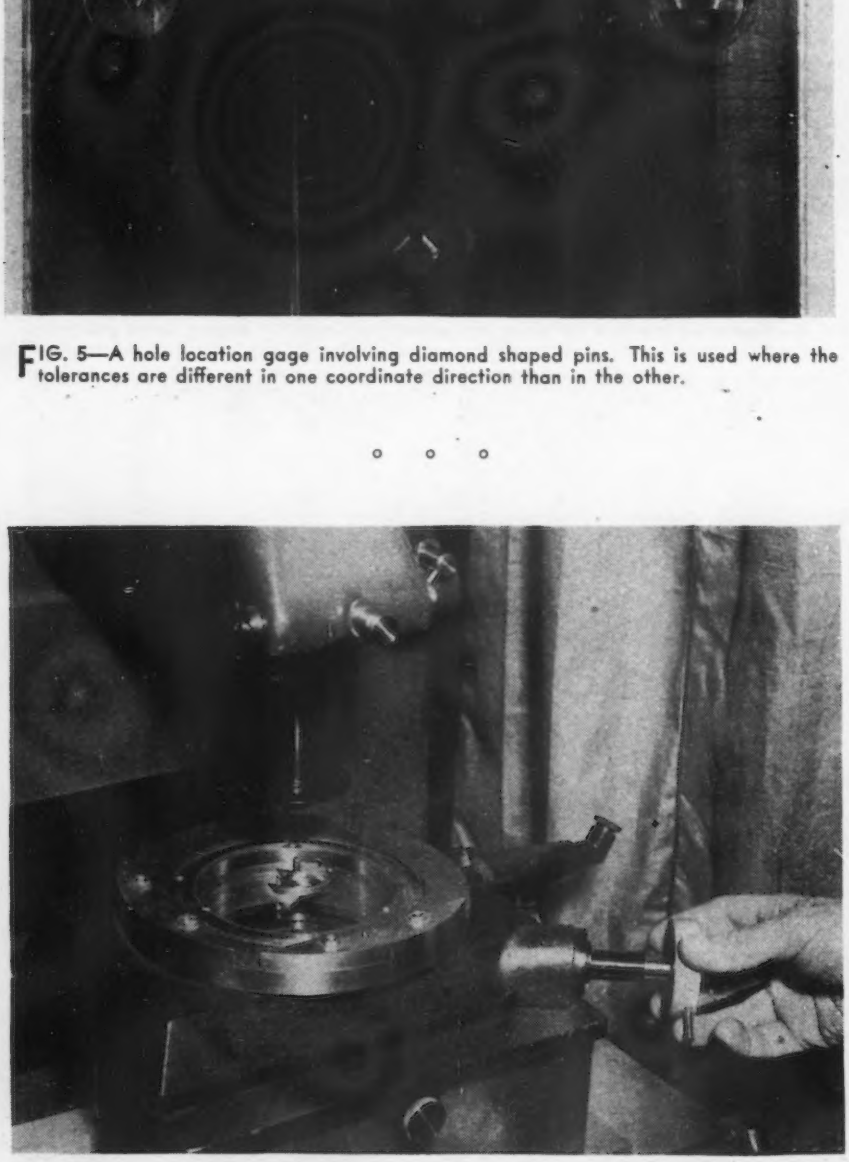


Fig. 6—Circular table applied to a contour measuring projector.

machine, the following general formula applies:

$$\pi (D + t) = \pi (d + t) + 2d + 2s$$

or

$$s = \frac{\pi (D + t)}{2} - K$$

where K is the constant: $\frac{\pi (d + t)}{2} + d$

and s = space between the two disks, in.

D = required work diameter, in.

t = take thickness, in.

d = tape measuring machine disk diameter, in.

Mass production jobs usually require special gages, sometime in quantity. These special gages may include the following: plain round plug gages, flat plug or paddle gages; adjustable snap gages, fixed snap gages, semi-adjustable snap gages; fixture gages involving flush pins, dial indicators and electric gages; templates; and location gages with accurately positioned pins protruding from a gage base. These pins may be either round or diamond shaped. The latter are used when it is necessary to provide a different amount of tolerance in one coordinate direction than in the other (Fig. 5).

Some mass production work is inspected with general-purpose gages such as comparators. These are usually set by the use of masters of the same shape as the part of the work which is being inspected. A comparator for a cylindrical portion of the work for instance, will be set by the use of a cylindrical master called a master disk. Likewise, for a rectangular portion of the work, the comparator will be set with a rectangular master or with gage blocks. To guard against errors which might occur in building up stacks of gage blocks, fixed masters are used for recurring settings of comparators. These masters are carefully inspected before they are put to use and receive occasional inspection afterwards. The required masters and a comparator provide very economical gaging equipment for external measurements.

Internal measurements usually require special internal measuring

means, such as plain or paddle plug gages, or amplifying gages of the dial indicator type, such as Electrolimit, air flow, or air pressure gages. For mass production, most indicating types of internal gages require special spindles or gage noses and "go" and "not-go" master ring gages for each size to be measured.

Optical Measuring Methods

Accurate templates and gages involving contours are measured on either a universal measuring microscope or a contour measuring projector. An optical dividing center and an optically divided circular table are at hand for use with the universal measuring microscope. The latter can be applied to the contour measuring projector as illustrated in Fig 6. With it the glass plate on which the work rests can be rotated in fine increments to match the shadow against the contour laid out on the screen.

The universal measuring microscope has been found very convenient for inspecting graduated scales such as vernier depth gages for accuracy of graduations. Incidentally, the vernier depth gage which is provided with two scale slots, one at the middle and one at one end of the gage (Fig. 7) has been found very convenient for both toolmakers and production machine operators. This depth gage is not provided with a fine adjustment screw. Instead, with the depth gage body in position on one surface of the work, a scale in the more convenient slot for the given job is moved until it makes contact with another surface of the work. The distance between these two surfaces is then read at the vernier scale.

Inspecting Hobs

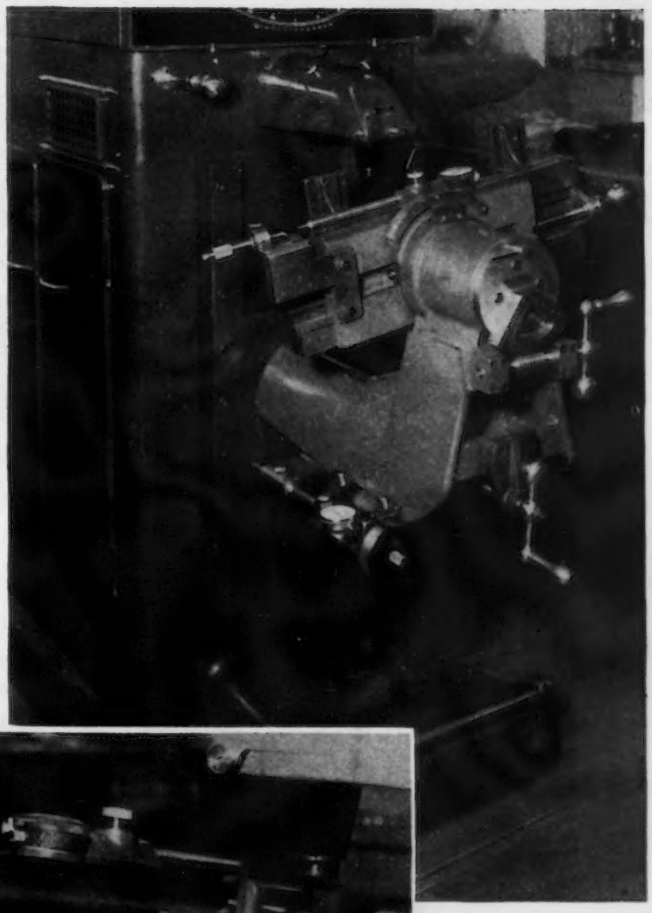
For inspecting hobs, a special tilting fixture, Fig. 8, has been made for the contour measuring projector. The head center of this fixture has been provided with a vernier protractor for measuring increments of rotation. The back of the fixture is shown close up in Fig. 9.

This special tilting fixture has greater capacity than the screw thread accessory which can be procured with this projector. When checking spirally gashed hobs for lead errors, it is well to measure increments of rotation and to compute the lead measurements accordingly. By means of a worm and sector the slide of the fixture is tilted to the helix angle of the hob and a reading taken with one flank of a tooth in focus; the protractor reading is also taken for this setting. The fixture slide is then moved longitudinally by the ball crank and screw and any other similar hob tooth flank of the same gash is brought into focus by

ABOVE

FIG. 7—A two-slot vernier depth gage. The vertical scale may also be inserted in the middle slot for measuring the depth of an internal surface.

o o o



LEFT

FIG. 8—A special tilting fixture made for contour measuring projector. It is especially useful in checking hobs.

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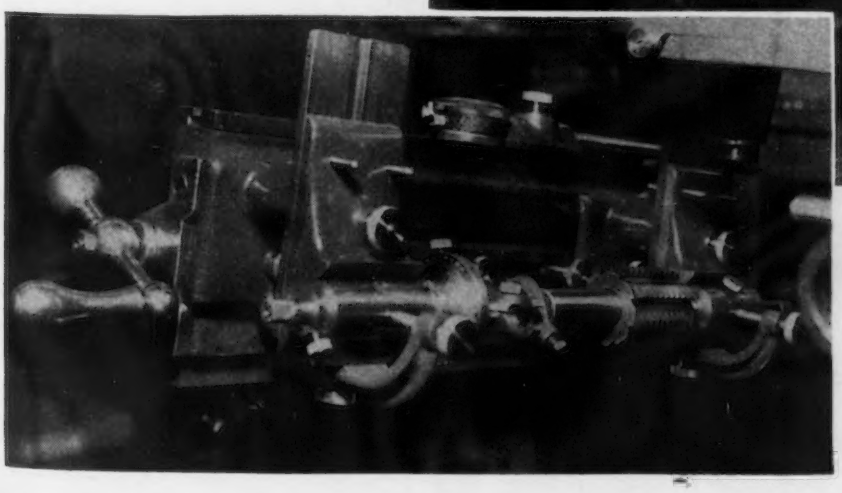
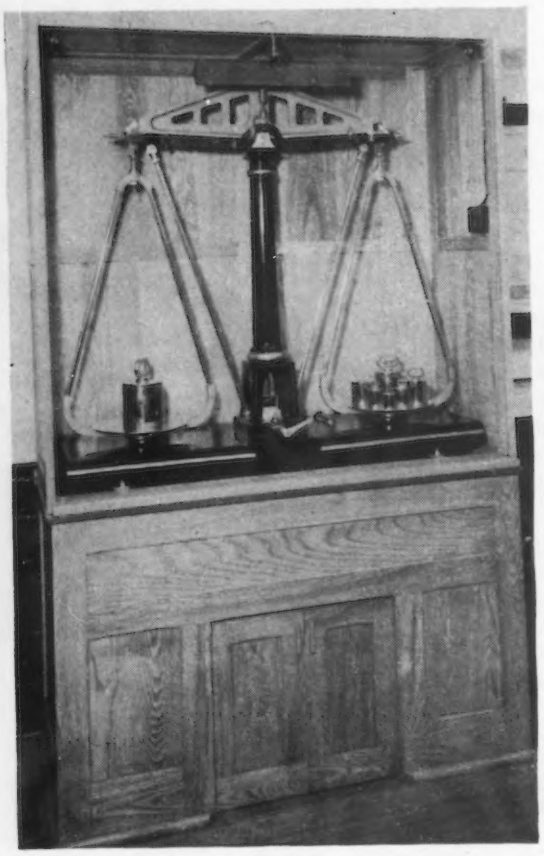


LEFT

FIG. 9—Head center of tilting fixture for contour measuring projector, showing vernier protractor for measuring increments of rotation when checking lead errors on spirally gashed hobs. This is a reverse view of Fig. 8.



ABOVE

FIG. 10—Precision balance for accurately checking weights. This instrument has a capacity of 67½ lb.

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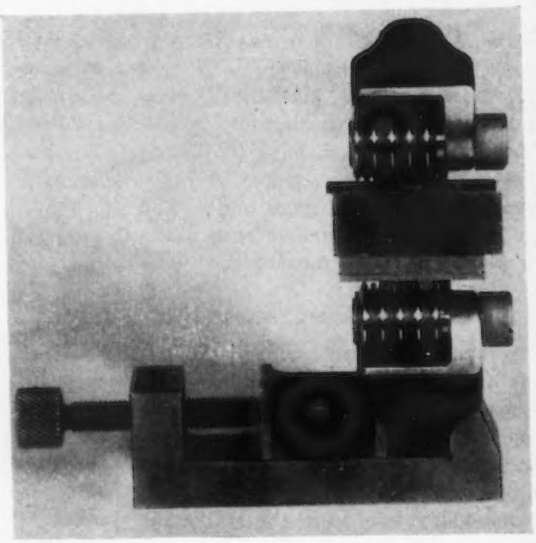

RIGHT

FIG. 11—Setting of roll thread snap gage with gage blocks when no master screw is available.

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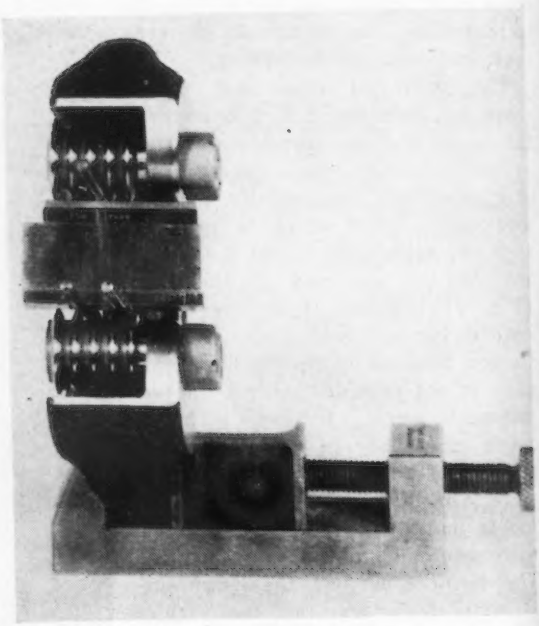

RIGHT

FIG. 12—Setting of roll thread snap gage with wires and gage blocks. These thread gage rolls have every other ridge removed.

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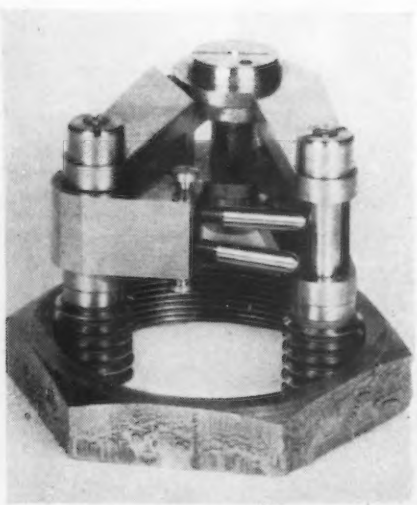

ABOVE

FIG. 13—Special internal thread gage using thread gage rolls applied in a nut.

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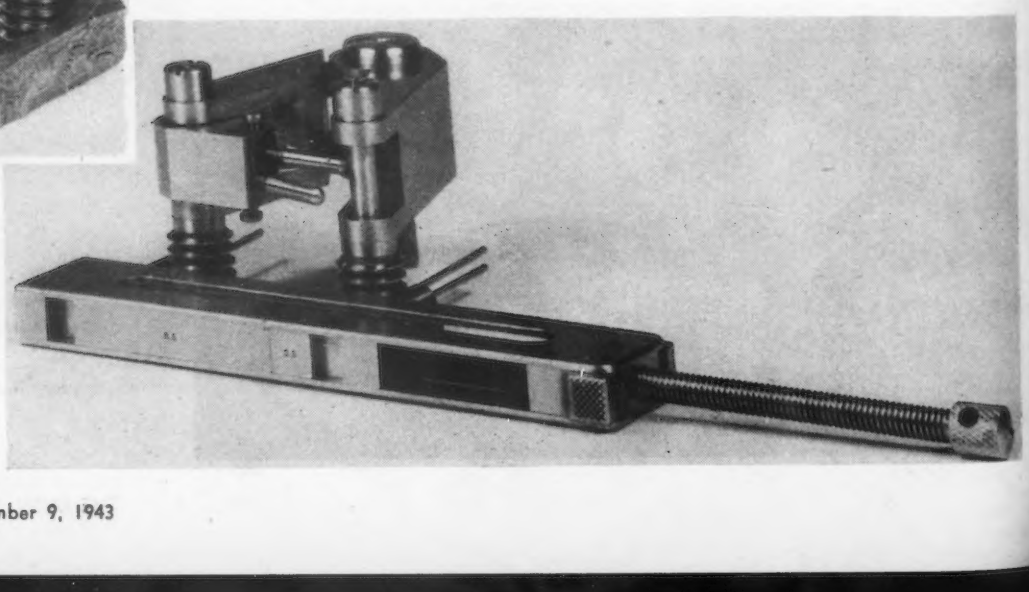
o o o

BELOW

FIG. 14—Special internal roll thread gage being set with wires and gage blocks. (See also Fig. 13.)



rotating the hob. This longitudinal reading is compared with the theoretical longitudinal distance, which is computed as follows:

$$D_l = PT \cos^2 \alpha$$

where

D_l = longitudinal distance

P = pitch, in.

T = number of threads spanned for the reading and

α = hob helix angle at the pitch line, deg.

Or:

$$D_l = PT - L \frac{\beta}{360}$$

where L = hob lead, in.

β = angle of rotation of the hob between readings, deg.

With the latter equation, it is not necessary to assume that the hob gashes are normal to the hob helix angle at the pitch circle.

Beside measurements involving dimensions, the gage inspection room is provided with a precision balance for accurately checking weights. Fig. 10. This balance has a sensitiveness of 2 grains at its capacity, which is 67½ pounds avoirdupois.

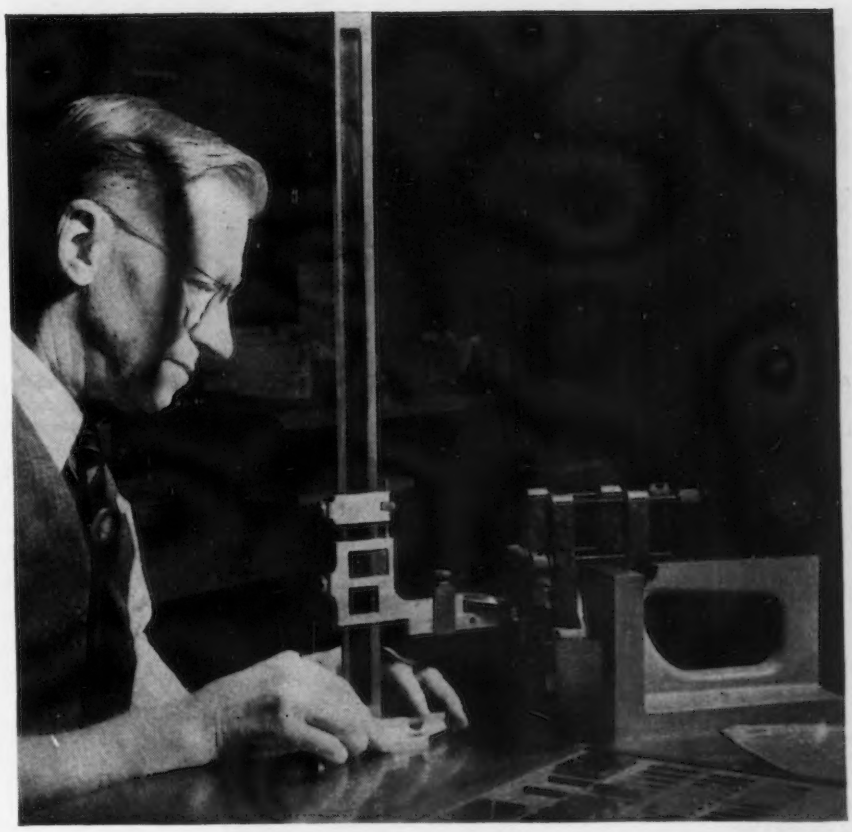
A vertical measuring microscope is used for making accurate measurements within a 4-in. range without using gage blocks. This machine has a graduated glass scale 4 in. long, and with it measurements can be taken to an accuracy finer than 0.0001 in. throughout the whole 4-in. range.

For measurements requiring extreme accuracy, the well-known Electrolimit gage is used. This comparator gage is set with master disks or gage blocks and has two ranges of measurement. A number switch throws one or the other range of measurement into use.

Female thread gages are inspected by the use of master setting plugs, which are maintained at the required accuracy.

Roll Thread Gages

When roll thread snap gages are to be set to a size for which no master is available, there are two methods from which to choose. If a master of the same pitch but of a slightly different diameter is available, the gage is first set to this master. Then gage blocks are fitted between the two opposing rolls, making contact on the crests of the ridges of the rolls, Fig. 11. Gage blocks compensating for the difference between the required pitch diameter and the pitch diameter of the available master are then stacked and the gage is reset to this new stack of gage blocks.



ABOVE

FIG. 15—Operator using surface plate and height gage method to inspect a gage. Use of an indicator gives greater sentitivity in measurement.

o o o

RIGHT

FIG. 16—Optical dividing head with Electrolimit indicator.

The major diameter of the thread rolls of these gages will usually be found concentric with the pitch diameter. If the major diameter should be eccentric to the latter, the roll can be marked or gripped so that the gage blocks will make contact at the same point of rotation each time.

When no usable master is available, the roll thread snap gages can be set with wires and gage blocks, as shown in Fig. 12. The following computations are used for 60-deg. threads when the gaging rolls have every other thread removed:

$$D = D_p + 2.598075P - 3D_w$$

Where D = distance between wires, in.

D_p = pitch diameter of screw or gage setting required, in.

D_w = wire diameter, in.

P = pitch of screw (not of ridges on rolls), in.

The best wire size to use for setting these gages which have every

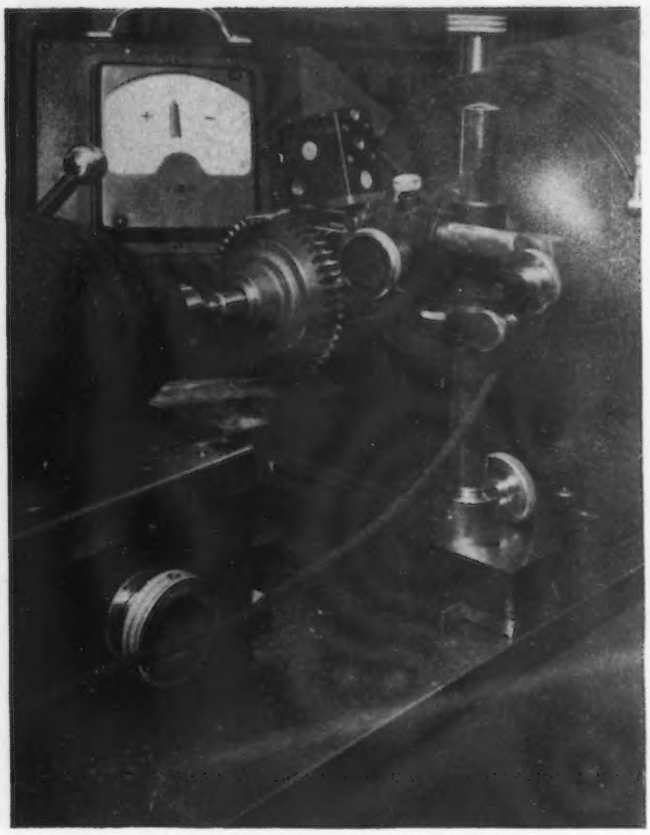


FIG. 17 — Close-up view of optical dividing head with Electrolimit indicator, shown in Fig. 16.

other ridge removed will be of such a diameter that the wire will contact the ridges where the pitch line of the work contacts them or $D\omega = 1.73205P$.

When any gage is adjusted by the wire method to the proper pitch diameter, the distance between the crests of the rolls for that particular gage should also be measured with gage blocks and the measurement recorded. This will provide a quicker means for rechecking later with gage blocks to determine whether the gage setting has been subsequently changed by shock or missetting.

It is, of course, always safer to have the right size of setting threaded plug when setting roll thread snap gages. Setting with the right size setting plug also takes much less time.

A special internal thread gage using thread gage rolls, Fig. 13, has been made for emergency use in measuring internal threads when required thread plug gages are not available. This gage can be set by the following revision of the previous formula:

$$D = D_p - 2.598075P + 3D_w$$

Setting can be made using gage blocks and wires or gage blocks alone as shown in Fig. 14.

For inspecting the position of holes or pins or other gaging elements in position gages or fixture gages, the usual surface plate and height gage method is used, Fig. 15. Other tools used include the angle plate or toolmaker's knee, V-blocks, and sine bar. When the required accuracy of the gage warrants, the height gage settings are checked with gage block stacks. The height gage is provided with an indicator. Involved gage computations are made with the aid of a calculating machine.

For measurements involving accurate divisions of the circle, an optical dividing head is used. This equipment has been supplemented with an Electrolimit indicator with which 0.0001-in. movement of the contact point causes a ¼-in. movement of the gage instrument hand (Figs. 16 and 17).

The gage inspection room is also used for the inspection of production parts when the available shop inspection equipment does not suffice as to accuracy, or when there is a difference of opinion among interested individuals such as inspectors, engineers and supervisors.

Surface Plate Inspection

Surface plates are usually inspected as follows: A surface plate of known accuracy is coated with a thin film of Prussian blue of Venetian red and the surface of the other plate is brought in contact with the coated surface. By sliding one surface on the other with an oscillating motion, the uncoated plate is coated with the color film at the points of contact with coated surface. On the other hand, when the surface of a plate is twisted, concave or convex so that it departs from a plane as much as several thousandths of an inch, the surface can be inspected by the method shown in Fig. 18. This photograph shows a granite surface plate being inspected for flatness by dial indicator and surface gage. The readings are plotted on a chart for each 3-in. square of the surface after a reference plane is established.

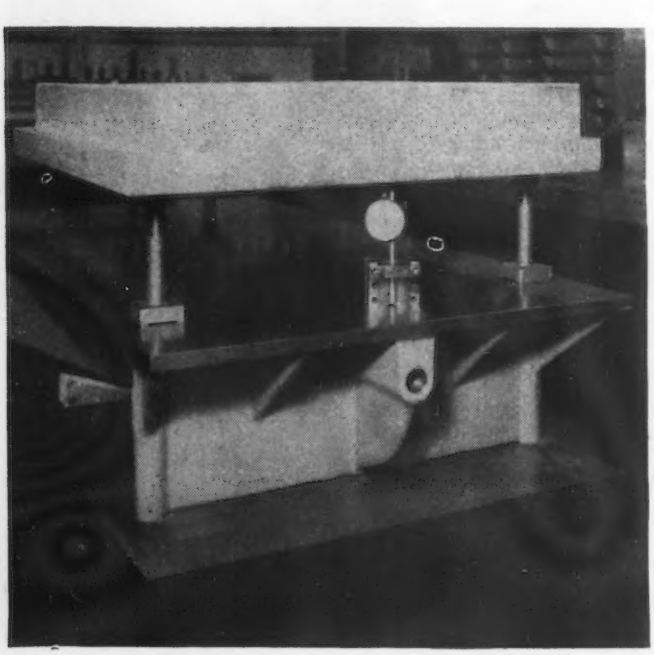


FIG. 18 — Granite surface plate being inspected for flatness by dial indicator and surface gage.

Metal Cutting Problems Feature A. S. M. E. Discussions

AT the 64th annual meeting of the American Society of Mechanical Engineers, three sessions on metal cutting research and four on general production engineering problems focussed more attention on machine shop practice than has occurred at any ASME annual meeting in years. Space permits reviewing only those particular papers, although altogether over 150 papers were presented at 55 simultaneous sessions held at the Hotel Pennsylvania, New York, during the week of Nov. 29-Dec. 4. Attendance, largest in the history of the society, ran close to 4500. Top flight engineers from all over the country attended.

ONE of the liveliest sessions, which ran past midnight, was a symposium on high speed milling participated in by ten engineers from all parts of the country. The meeting began by the showing of a colored motion picture on West Coast practices presented by H. A. Frommelt, director of research, Kearney & Trecker Corp., who illustrated the data that was presented in tabular form in a recent issue of THE IRON AGE (High Speed Milling in the Aircraft industry—Oct. 14, 1943). This film and the article mentioned pointed to radical new thinking in milling speeds and feeds, particularly for aluminum, and indicated that radical redesign changes would be necessary in milling machines.

In discussing this latter angle, W. A. Dean, Aluminum Co. of America, said that in the future peripheral speeds of 5000 to 10,000 ft. per min. will be standard in milling and from 2000 to 3000 ft. per min. in turning aluminum. As a result he saw the following trends in machine tool designs:

1. Adequate power, rigidity and freedom from vibration
2. Wider range of spindle speeds, preferably through electronic speed changes so as to preserve a constant peripheral speed of cutter
3. More extensive use of hydraulic and electrical drives
4. Well lubricated and well balanced spindles
5. Use of cemented carbide tools
6. Provision for handling the large quantities of chips produced through possible conveyorization
7. Provision for bringing large quantities of cutting compound to the cutting zones, with possible refrigeration of the cutting medium
8. More efficient methods of feeding work to and from the machine
9. Use of air clamps to facilitate loading and clamping
10. Making rotating parts as light as possible to reduce inertia effects.

In general Mr. Dean commented that the machine tool industry had developed around the properties of the heavy metals and hence present equipment is not really adaptable for the high speeds necessary for machining aluminum alloys. With aluminum challenging copper for second place in metal production, he predicted that peacetime industries will demand machines best suited for machining aluminum.

W. E. Marshall, carbide tooling engineer, Boeing Aircraft Corp., also looks for radically new designs in machine tools specifically built for use with carbides. He stated that the future use and continued development of carbides is imperative for further progress in metal cutting. Negative rake milling he considered one of the greatest advances made in metal cutting in recent years.

Negative Rake Milling

Reviewing the work done at Boeing in negative rake milling of high alloy steels, Mr. Marshall said that experience indicated the use of lower speeds than originally tried (around 700 to 800 ft. per min.), higher feed rates and consequent higher chip loads to give the most economic tool life. Too light a chip load is detrimental both to the cutter and to the work and use of feeds per tooth from 0.003 to 0.010 in. actually generated less heat and prolonged the life of the cutter. He cited an example of milling SAE 4130 steel with a hardness of 22 Rockwell C at 580 ft. per min. with double negative angles of 10 deg. and a chip load of 0.003 in. per tooth. In all applications, Boeing favors the use of a heavy flywheel on the cutter arbor to smooth out the impact blows when cutters of a small number of teeth are used. Alloy steel parts are machined dry and the only cooling employed is a blast of air to blow the chips away from the work and to prevent entrapment of chips between cutter and work. In one design the air blast is directed radially outward from the center of the cutter.

Ralph G. Hummer, master mechanic, Defiance Machine Works, also indicated that he favored double negative angles of 10 deg. for best results on both cast iron and steels. He prefers Meehanite bodies because of the dampening effect of this high strength cast iron material. In machining cast iron, negative rake milling cutters have three times the tool life of conventional carbide cutters because of the backed-up edge and have eight times the life of high speed steel cutters.

A Dissenting Voice

The only one who disagreed with the use of negative rake and negative helix angles on milling cutters for high alloy steels was Arthur A. Schwartz, director of tool research, Bell Aircraft Corp. Negative rake angles favor the weakness of carbides in transverse rupture strength, and he maintained that shopmen would forget about negative rake the day they can obtain carbides with high tensile strength. It stands to reason, he said, that the more shear angle you use, the easier the chips will come off. Mr. Schwartz believes in the use of as few a number of teeth as possible. It would pay, he said, to take out every other tooth in a milling cutter. He prefers the use of the empirical formula for the number of teeth in a cutter to be the number of inches in diameter *minus* 2 instead of *plus* 2 as used in some of the West

Coast aircraft plants. Like the others he agreed it is necessary for the cutter to take a good "bite," meaning a high chip load, and to provide a high horsepower to carry the load. Incidentally Mr. Schwartz favors malleable iron bodies with induction brazed tips. With tips mechanically clamped in the cutter body, he maintains that ultrasonic vibrations are set up that are detrimental to carbide cutters.

While indicating that double negative angles were very successful in milling alloy steels like SAE 4130 at high speed, Ben P. Graves, director of design, Brown & Sharpe Mfg. Co., stated that good results had been obtained with 0 rake cutters in both this country and in Canada. Such a design simplifies the grinding and maintenance of such tools. Like many others Mr. Graves advocates the use of climb milling, particularly as an aid in clamping and he also favors the use of air blasts as a coolant.

In one test on SAE 1010 steel, changing from a standard helical slab mill to a 2-tooth end mill with 4 deg. end clearance stepped up the number of pieces obtained between grinds from 6 to 54. He declared that the number of teeth in the cutter is largely governed by the horsepower available, which in the tests made at the B. & S. shops were within the rated horsepower of the machine. In many of the tests made on the West Coast, the standard motor provided has been overloaded several hundred per cent.

Experiment with Fly Cutters

Agreeing with Mr. Schwartz, Fred W. Lucht, Jr., development engineer, Carboloy Co., cited an example in the milling of automotive connecting rods at 400 ft. per min. whereby removal of half the teeth from the cutter had doubled the feed per tooth and thereby stepped up the output from 10 to 30 pieces obtained between grinds. Because large sized multi-bladed carbide cutters are expensive, Einar Almdale, service engineer, Carboloy Co., suggested that plants interested in starting a program of negative rake milling had better develop the desired angles and their experience through the use of fly cutters. Such cutters are easy to construct and any failures due to misjudgment of the working condition will not result in the loss of expensive tools. As to the number of teeth to be used, Mr. Almdale suggested one quarter the number of teeth normally used in high speed steel cutters and double the present body thickness.

The theory of negative rake milling was explained by Dr. Hans Ernst, chief research engineer, Cincinnati Milling Machine Co., who agreed with Mr. Marshall of Boeing that the present tendency in milling steel is toward slightly lower peripheral speeds than were thought of a year ago; he also favored the use of high chip loads and of flywheels on the spindle or arbor. While negative rake milling seems opposed to all metal cutting theories and ought to be accompanied by higher power consumption, this relationship does not hold at high speeds. Although the amount of power required for positive rake tools goes up as the speed increases, with negative rake tools there is a marked decrease in the cutting force as speed increases. At the lower cutting speeds the force on negative rake tools will be quite high but as the speed goes up there will be a point at which the line representing the tangential force on negative rake tools crosses the line representing increasing force on positive rake tools, in other words where the cutting forces will be equal for either type. The heavier the feed, the lower the speed at which these forces will be equal for a 10-deg. positive tool and a 10-deg. negative tool. It follows therefore that as speeds are increased with the availability of better carbides, a lower power consumption per cubic inch of metal removed can be expected.

Dr. Ernst theorized that in negative rake cutting the temperature increases to a very high value at the face of the tool and when carried to the extreme it brings the metal into the plastic state or very close to the melting point. The chips actually adhere to the face of the tool and shear takes place between slip planes of the semi-fluid material. He compared this action to the phenomenon that occurs in ice skating where pressure of the blade actually melts some of the ice under the blades and thereby reduces the coefficient of friction. Tests made in the laboratories of the Cincinnati Milling Machine Co. indicate that the coefficient of friction at the face of a cutting tool dropped from 1.24 to 0.66 by changing from positive to negative angles on the tool. Furthermore, the build-up edge decreases as the cutting speed rises. Dr. Ernst concluded by saying that negative rake angle milling is here to stay.

The colored motion pictures shown by Dr. Frommelt indicated that in many cases the chips were incandescent as they left the cutter, which would tend to confirm Dr. Ernst's theory.

Design of Milling Cutters

In a later meeting, Fred W. Lucht, Jr., Carboloy Co., took up in detail the elements to be considered in milling steel with carbide tipped cutters. Comparing the action of a milling cutter blade to that of a lathe tool taking an interrupted cut (speed and feed relationship reversed, however) he showed how the use of negative shear (back rake) and negative helix angle (axial rake) favored the carbide tip by bringing the impact load away from the cutting point. Further improvement in milling cutters is obtained by modifications of the radius or chamfer angle which should be the last part to enter the work. Carboloy recommends shears angles of 8 to 10 deg. negative for face and straddle mills which cut past the part, but Mr. Lucht warned that it is the "effective" shear angles, measured with respect to the angles of the workpiece, that are more important than actual blade angles.

Rake angles in use today vary between +8 deg. and —10 deg. On milling applications where the cutters mill past the work and bevel angles can be used, a positive rake is advantageous for soft steels and a negative rake for hard steels, Mr. Lucht said. Indications are to use about 8 deg. positive rake for steels below 200 Brinell hardness and gradually reduce the rake to 5 deg. negative for steels in the 325 to 500 Brinell hardness range. For most face and straddle milling operations, a bevel angle of 15 deg. is usually satisfactory. However, where such an angle is insufficient to assure the chamfer entering the last cut, the bevel angle should be increased up to as much as 35 deg. if necessary. The width of the bevel should be sufficiently large to cover the full depth of cut. Incidentally, the speaker stressed the necessity of grinding a chamfer or radius on all milling cutters to remove the extremely frail sharp corner which is inclined to flake off when the cutter is in use.

Mr. Lucht gave the following formula as a means of estimating the number of teeth required in a milling cutter in order to keep within the power available:

$$N = \frac{0.56 \text{ Hp.}}{D\,F\,R\,W}$$

Where D = max. depth of cut, in.
F = feed per tooth, in.
R = r.p.m. of cutter
W = max. width of cut, in.

It follows that

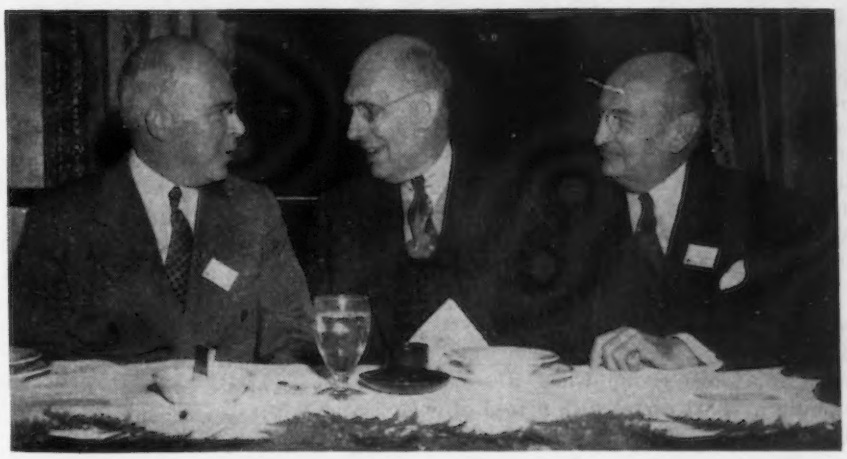
Horsepower required = $1.8\ DFNRW$

These two formulas are based on 1 hp. being required to remove ¾ cu. in. of steel per min., with an allowance of 35 to 40 per cent more power for a

dull cutter compared with a sharp one.

Permissible runout on cutter o.d. is a determining factor in limiting cutter diameter for this class of work. Careful grinding is essential, but it is obvious that the tooth load should be 0.001 to 0.002 in. more than the permissible runout, if teeth are not to drag on the work and dull rapidly. In the discussion, it was brought out that some users favor smaller cutters for this reason, even to the extent of using fly cutters with one or two blades.

Varied viewpoints were expressed on coolants for negative rake milling of steel. Mr. Lucht advocated dry cutting inasmuch as the chips are thin and a major portion of the heat flows into them. On the other hand, M. F. Judkins, chief engineer, Firthite Division, Firth-Sterling Steel Co., cited an example where the number of pieces obtained between grinds had been stepped up from 40 to 150 through the use of a sulphurized mineral oil in milling carbide tip recesses in steel shanks with a ½ in. end mill operating at 2500 r.p.m. and a feed of 12 in. per min.



ROBERT M. GATES (left), president elect of the American Society of Mechanical Engineers and president, Air Preheater Co., New York, seen beside Charles F. Kettering, vice-president and director of research, General Motors Corp., who was the recipient of the Fritz Medal and also the ASME Medal, 1940, for outstanding inventions and research. At the right is Harold V. Coes, retiring president of the ASME and vice-president, Ford, Bacon & Davis, Inc., New York. The ASME Medal, 1943, was presented to Lewis K. Sillicox, first vice-president of the New York Air Brake Co. and vice-president of Hydraulic Controls, Inc., Chicago. Igor I. Sikorsky, inventor of the helicopter, received the Worcester Reed Warner Medal and Dr. Vannevar Bush, president of the Carnegie Institute, Washington, received the Holley Medal.

True Rake Angle

In another paper on milling cutters, Dr. Max Kronenberg, Cincinnati Milling Machine Co., maintained that in any cutter design, it is the "true" rake angle that counts rather than the back rake and side rake. He defined true rake as the rake in the plane of chip flow which he claimed is always at right angles to the cutting edge. In a longitudinal turning tool this is the side cutting edge; in a milling cutter it is the chamfer cutting edge. The true angle can be determined by trigonometric analysis if the radial rake (shear or back rake), the axial rake (helix angle) and the corner or chamfer angle are known. Dr. Kronenberg presented alinement charts whereby the true rake angle could be determined graphically for any given set of conditions for the three angles mentioned.

Several in the audience disputed this theory and indicated that chip flow is not precisely at right angles to the cutting edge. W. W. Gilbert, University of Michigan, for example, stated that with heavy feed, the shearing of metal off the diameter, as contrasted with the bevel shoulder of the cut, affects the direction of chip flow. Dr. Hans Ernst, Cincinnati Milling Machine Co., said this component of force and hence chip flow is small enough to be neglected. Charles G. Kraus, Consolidated Machine Tool Corp., agreed with the author's analysis of true rake angle as far as the trigonometric analysis was concerned, but suggested that a similar analysis be made of the true shear angle, representing the component of chip flow along the edge of the tool as a result of the angular approach of the milling cutter blade to the work, such as occurs with an Ingersoll "Shear-Clear" cutter, which he helped develop.

Dr. Kronenberg had pointed out that there can exist on the same tooth two or more different corner angles. The true rake angle at one corner can be positive and at the other negative if the radial rake is positive and the axial negative, or vice versa. In the case of a straight cutting edge, it is possible to obtain the largest true rake angle for given values of axial and radial rake angles by selecting one definite corner angle for each positive-positive or negative-negative combination of the rakes. He concluded by stating that the true rake angle will always be positive if the axial and radial rakes are positive and will always be negative if the two rakes are negative.

Spar Milling Practice

One of the outstanding applications of high speed milling of aluminum alloys in the last few years has been exemplified in the development of wing spar millers using high-cycle, super high speed spindles driving carbide tipped cutters. Paul Dubosclard, president, Paragon Research, Inc., described the development of the Farnham millers for which his company did the engineering. In these machines, of which 80 have been built, the extruded aluminum spar is rigidly clamped to a long, stationary table and the milling heads are mounted on a carriage which is traversed the length of the table by screw or helical rack at feed rates varying between 24 and 240 in. per min. Each milling head is connected by linkage to a cam follower which rolls along a template fastened to the side of the bed. The linkage imparts to the heads either vertical or horizontal translation or rotation around a center. The inertia of the heads counteracts cutter impact loads and because the heads are counterbalanced, the cutters literally "float" over the work a few thousandths above the position they would occupy at rest.

Motors up to 40 hp. drive each spindle, which runs at a basic speed of 3600 r.p.m. Most of the heat generated by cutting goes into the chips so that the spar itself is raised in temperature less than 15 deg. F. when 200 hp. is being applied through a battery of spindles. As large a chip load as possible is maintained, giving efficiencies of metal removal as high

as 2.5 to 4 cu. in. per hp. for 24ST aluminum alloy. The minimum chip load is 0.003 in. per tooth and to maintain these loads at the high peripheral speeds used, cutters with more than four teeth are seldom required. Many of them have only two teeth. Cutter diameters are 8 or 9 in. and are massive to produce a flywheel effect (large WR^2). The bodies are made of boiler plate or high test iron.

Mr. Dubosclard cited the interesting case of where a green operator accidentally ran an 8-in. carbide cutter into a steel clamp when it was running at 3000 r.p.m. with a feed of 50 in. per min. The clamp was neatly cut in two without injury to the cutter. While not advocating the milling of steel at these speeds (6300 ft. per min.), the speaker said it opened his eyes as to future possibilities.

Application of electronically controlled feed motors to spar millers permits variations in feed to be provided according to the depth of cut, it was indicated by Frank H. Penney, General Electric Co., who spoke on the subject of electronics applied to machine tools. Through the use of an additional cam plate on the side of the miller, it is possible to vary a pair of rheostats so as to increase the feed with light cuts and decrease it with heavy cuts, thus maintaining full load on the spindle motor. It is even possible with electronic control to obtain changes in speed of the feed motor as a direct function of the load on the cutter motor. In these applications, of course, the spindle motor speed remains substantially constant.

Chip Control Symposium

Four speakers participated in a symposium on chip control. V. H. Ericson, abrasive engineer, Norton Co., told how cutting tool life could be increased by a better finish. He stated that in ordinary practice a surface roughness of 20 to 30 micro-in. is obtained with 46 and 60-grit grinding wheels. Such surfaces when magnified (100x) have the appearance of saw teeth in section. Use of fine grit wheels for finishing cuts gives a surface finish from 2 to 5 micro-in. and produces keen edges. Some of the benefits of fine tool finish cited by the speaker include:

(1) Longer life of cutting tools because sharpenings are fewer
(2) Fewer grinding wheels used
(3) Increase of output between grinds
(4) Less power consumption
(5) Better quality of work.

Chip control is important in cutting tough, ductile steel with carbides as the chips come off fast, sharp and hot. According to Malcolm F. Judkins, chief engineer, Firthite Division of Firth-Sterling Steel Co., the use of steep rake angles, small feeds and the high speeds available with carbides tends to form continuous chips which are troublesome. For light cuts at high speed, Mr. Judkins favors double negative rake angles since these tend to fold the chip back on itself and break it. The second choice lies in the use of a chip breaker groove or clamp deflector although the built-up edge is accentuated because of the tendency of breakers to impede the chip flow. Most success in forming chip breaker grooves can be obtained by grinding the rake angle in from the edge of the tool, leaving the top of the tip flat.

For rough turning, parallel grooves can be used as they form helical chips; grinding the groove at an angle of 8 deg. to the cutting edge tends to break the chip into short lengths and therefore simplifies handling. Mr. Judkins advocates the use of chip breaker grinders in place of hand grinding of tools, using diamond impregnated wheels. He agreed with the previous speaker that any time spent in refining the cutting edge will be repaid many fold.

Tool Standardization

Application of chip breaker grooves to high speed steel tools was exemplified in a line of standardized single-point cutting tool, developed at the Wright Aeronautical Corp. Early work along this line was first reported by the same authors, Carl J. Wiberg and Wesley K. Heath, special process division, in THE IRON AGE, July 3, 1942, p. 33. This research showed that the life of H.S.S. cutting tools could be extended as much as 2000 per cent by fine tool finish, correct design and proper tool setups. Since that time, fine finish, parallel type chip breakers have been applied to four classes of tools—turning, facing, boring and chamfering. In the standardization program the number of different tool shank sizes has been held to seven for turning and facing, six for boring and five for chamfering. Nose radii were held to seven values between 0.030 and 0.250 in. The tool holder slot angles selected vary between 0 and 90 deg. in intervals of five days. This rather large selection of slot angles was necessary in order to provide tools for existing tool blades; in the case of new equipment, the number of slot angles can be reduced considerably.

Mr. Heath, who read the paper in the absence of Mr. Wiberg, illustrated several sample pages from various tool standards and explained the style number system employed. The use of these numbers enables an operator to obtain tools from the crib by style number, size and nose radius in the same manner that he would request a drill or tap. Similar standards have been worked out for carbide tools except that chip breaker design is divided into two types—8-deg. angular and parallel. Four grades of carbide have been approved for machining steel and four grades for cutting non-ferrous metals.

Chip Disposal Methods

Getting chips from machine tools to steel mill or foundry is a problem in material handling that has been accentuated by the tremendous installation of machine tools in large plants for war production. The various systems now in use were illustrated in a series of slides presented by Frank J. Oliver, technical editor, THE IRON AGE. Although premiums are no longer obtainable from scrap dealers on alloy content, WPB Order M-24-c directing segregation of alloy scrap at the source still is in force and effective separation of alloy turnings still is profitable, particularly where carload lots of one analysis can be made up. Breaking up long curly chips is a necessity and Mr. Oliver illustrated a number of chip crusher installations, many of them in connection with briquetting presses. The speaker reviewed current practice in the latter connection and analyzed cost estimates which vary from $2 to $11 a ton for steel briquettes, including overhead and maintenance charges. He pointed out that several foundries add a small percentage of soda ash to cast iron briquettes to hold down possible sulphur build-up. Experimentally, one foundry has operated on 100 per cent cast iron and steel briquettes in the cupola metal charge.

A European method of mechanical ingoting aluminum and magnesium turnings is a process combining briquetting with sintering at temperatures varying between 500 and 850 deg. F. in between the two pressings. The result is an ingot of practically 100 per cent density.

A proposed method of tool life tests

(CONCLUDED ON PAGE 142)

SPEED PRODUCTION
CUT DOWN COSTS
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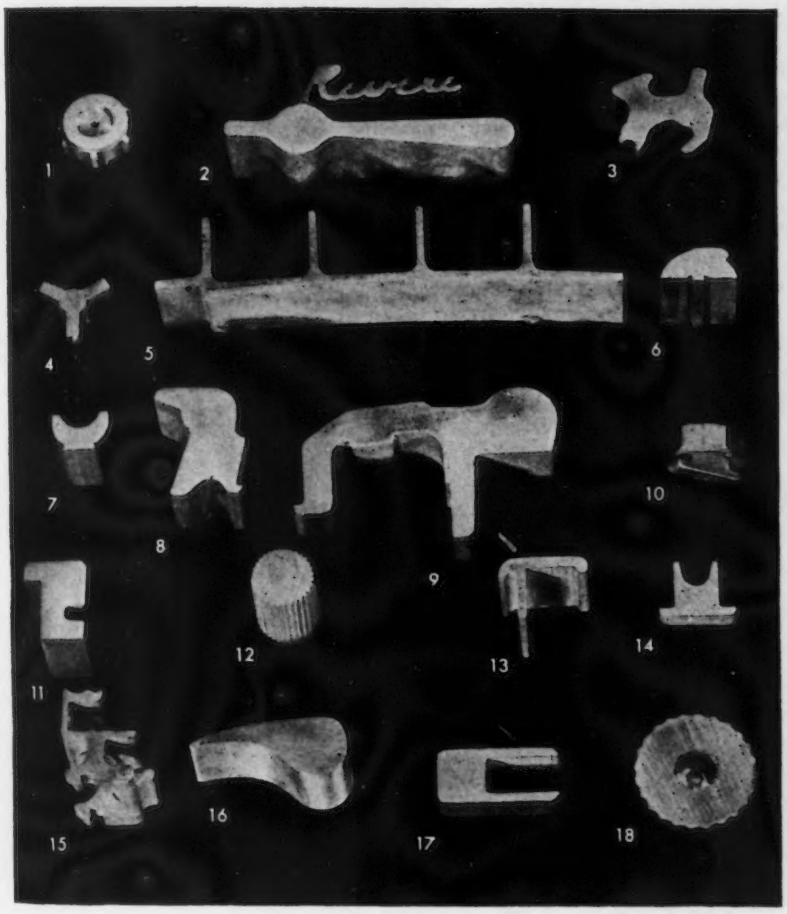

SOME TYPICAL REVERE EXTRUDED SHAPES

(1) irregular rod for camera parts; (2) faucet handle; (3) refrigerator door lock dog; (4) nozzle part for industrial spray; (5) vacuum filter section; (6) loom section; (7) automotive hardware-lock section; (8-9) sections used as arms in heavy electrical switch assemblies; (10) electrical part; (11) piston ring section; (12) serrated rod for inserts in plastics; (13) desk edging; (14) connector part; (15) assembly of shapes for storefront sections; (16) comb for straightening pile; (17) shower door frame; (18) surveying instrument knob.

SEND FOR YOUR COMPLIMENTARY COPY of "Revere Copper and Copper Alloys—Technical Information for Product Designers"—this 54 page illustrated manual is invaluable to anyone working in non-ferrous metals. Address: Executive Offices.

Perhaps not everybody realizes that while primarily engaged in supplying sheet, strip, rod, bar, tube, and other mill products, Revere is also prepared to furnish a considerable number of fabricated, semi-finished materials and parts.

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STANLEY H. BRAMS

• Reconversion thinking anticipates limited auto production after German defeat, while Pacific war continues . . . Body plants surveyed in this respect . . . Merchandising plans are being made.

DETROIT — Continuing the discussion begun in this column last week, automotive plants are giving increasingly concentrated attention to the detailed phases of the reconversion problems. These phases include not only the strictly manufacturing problems, but the merchandising considerations as well, and these latter should be mentioned in passing.

Sales divisions are taking time out to ponder the new problems of car distribution and market coverage. Plans have long since been made, built around pro rating available vehicles to dealers on the basis of past sales performances.

But beyond that the sales divisions are looking at mothball-tainted zone and district maps, figuring where their distribution chains are weakest and where they can be strengthened. No trade reports yet tell of field men out selling franchises, as in the old days, but they would be no surprise in the near future.

Dodge has newly appointed a director of territory development and Chevrolet is thinking of calling in field men for a near-term sales meeting.

Advertising agencies, too, are getting squared away for an ultimate resumption of bigger promotional programs. Ruthrauff & Ryan, agency for Dodge and DeSoto at this time, have taken larger quarters in Detroit. N. W. Ayer, appointed last summer for Plymouth, is expanding its activity. The Ford account was switched to J. Walter Thompson Co. last week.

The basic thesis of current reconversion planning is that it will be in stages, with a first step permitted at the ending of the European war, even though the Pacific war continues. At such a time, needs will be greatly reduced for many types of war goods, making available materials and, to a lesser extent, manpower and factory facilities.

Plants which are largely identified with ordnance work, then, would be excellently situated with respect to reconversion, provided they do not lie in areas where manpower is so tight that curtailments will merely relieve strain rather than make the labor supply easy. Conversely, plants which are primarily identified with aircraft or naval requirements—the latter consideration is a minimum among passenger car plants—will have much smaller chance to re-engage in civilian goods output.

There is a faint new possibility of relief in the aircraft section, growing out of recent Army Air Forces cutbacks of certain automotive plant schedules for plane engines. The possibility exists, therefore, that automobile plants whose facilities are tied up by plane motor manufacturing may be freed of such commitments, or may find their load sufficiently reduced that they can plan to turn out automobiles once again alongside their war jobs.

AUTOMOBILE manufacturing, to go down to fundamentals, involves a chassis and a body; comparatively few automobiles are fitted with bodies made in the same plant as the chassis. A look at the body availability picture, then, may provide a good prelude to general survey of the reconversion scene.

There are nine body producers in the auto industry, Fisher, Briggs, Murray, Budd, Ford, Chrysler Corp., Hudson, Packard and Seaman (Nash).

Fisher, of course, is subdivided into production for all General Motors divisions. The situations vary in each of the plants supplying specific divisions.

Work in the Pontiac and Lansing areas has been tied up closely to the ordnance programs of the Pontiac and Olds plants; with such operations in a declining phase, partial reconversion without undue difficulty should be written down as a good bet. Flint Fisher work has been importantly on tank component parts, and hence reconversion after the European hostilities end also appears likely, benefiting Chevrolet and Buick.

In the cases of Fisher plants supplying scattered other Chevrolet assembly points, no great problem is indicated for at least limited production. Several of these plants were incapable of complete gearing to the war effort, and have stand-by facilities at hand.

Ward M. Canaday chairman of the board of Willys Overland Inc. has been elected president of the firm succeeding Joseph W. Frazer, recently resigned. Mr. Canaday's association with Willys Overland began in 1916. *In* 1936, *following the death of John N. Willys, Mr. Canaday successfully reorganized the company and became chairman, a position he continues to hold.*

Basic Fisher production plants, however, are not so fortunately situated. The Detroit units are tied up with a variety of output, much of which will likely continue through the war, although some instrumentation work may turn out to be ahead of needs in the same manner as aircraft engines are now ahead. Cadillac body requirements were largely met in the past at Detroit, so the chances for that maker to resume civilian output may be shadowed.

Fisher's big operations at Cleveland and Memphis are tightly hinged to the airframes program, and hence appear rather unlikely to be available for reconversion until Japan's defeat.

Briggs, second largest body maker, supplied many Chrysler Corp. requirements, and is now heavily loaded with airframe work which may preclude its reengagement in the auto field. However, Briggs also is undertaking various Ordnance projects which may come to an end when European hostilities cease; jog juggling may permit partial resumption of passenger car body manufacture.

Murray is less fortunately situated, completely engrossed as it is in airframe production. Some space may be available for body work, but hardly an adequate amount until the plane programs are completed.

Budd Manufacturing plants at Detroit and Philadelphia are undertaking a variety of war work, much of which will conclude when European peace comes. At the same time, Budd has been stamping sheet metal for military vehicles; it would seem, therefore, that this producer will be

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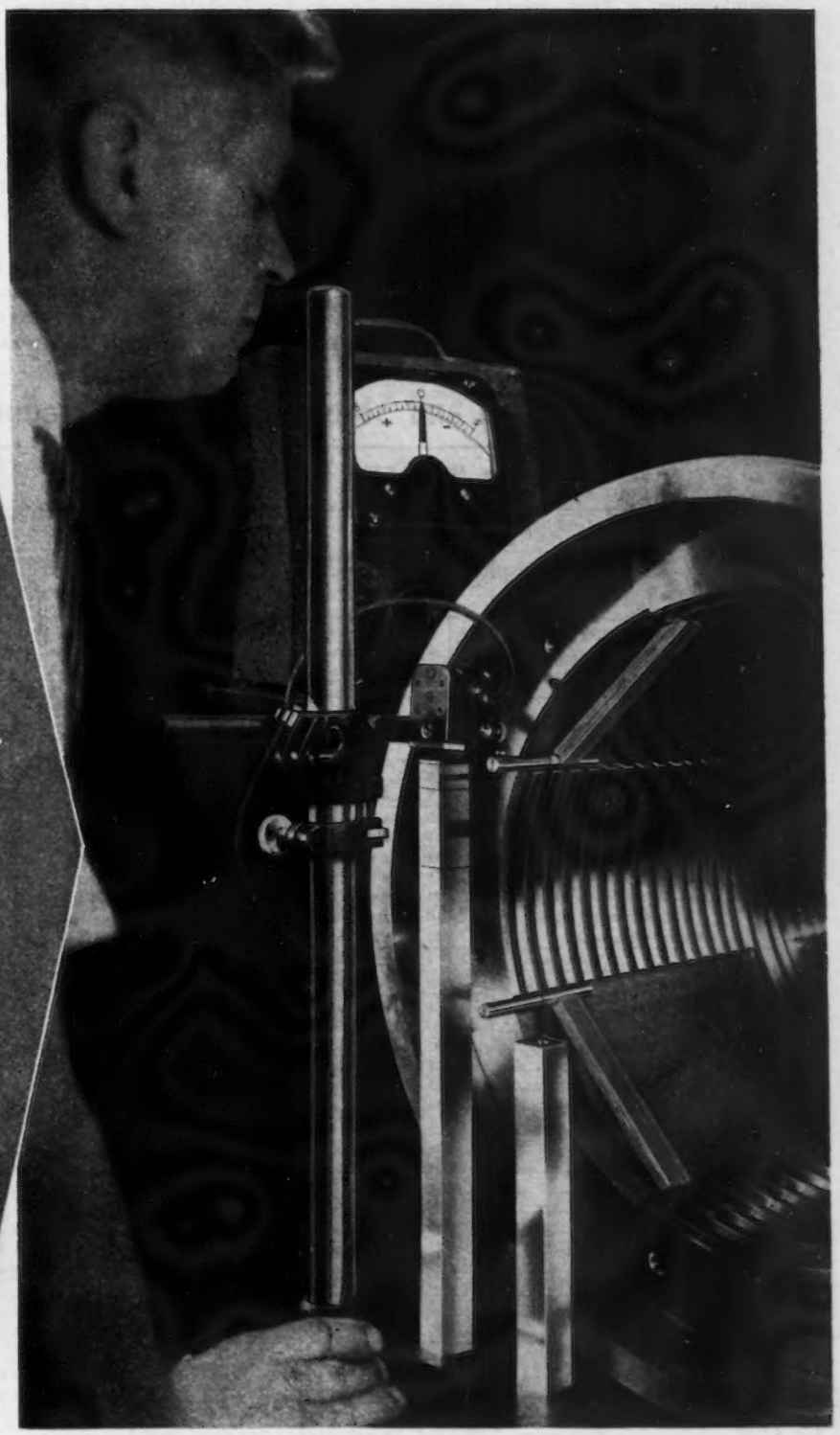

Accuracy — to millionths of an inch — at work on the war production front. A skilled craftsman uses a stack of P&W Hoke Precision Gage Blocks to check a vital point in a breech block gage.

Since World War I — when P&W pioneered and perfected the manufacture of these Hoke Precision Gage Blocks — they have steadfastly remained *the* basic standard of measurement.

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able to make a fairly ready partial reconversion. This could provide bodies for Studebaker, and components for other producers as well as for former customers.

Ford's body-making facilities can probably be reconverted without interference with any programs which would continue after the European war ends. In such a situation, the space and facilities at the Rouge should meet requirements. The same holds true, but to a definitely lesser degree, for Chrysler's body making facilities; and these might serve partially to balance any Briggs body production deficits in an interim reconversion period.

Other company owned body facilities are in less fortunate lights. Hudson's body plant, for example, is filled with important airframe work, and may have to continue such activity until plane requirements are satisfied. The Seaman Body Div. of Nash-Kelvinator has been largely metamorphosed into a parts supplying unit for the company's engine, propeller and helicopter contracts. As such, its availability for body output is impaired.

Space for Packard's body making facilities has been all taken up, as has virtually the entire balance of the plant, in equipment for producing Rolls-Royce and marine motors. Ending of these programs before the wind-up of the Pacific War is questionable; and if they are continued Packard will likely be unable by itself to fill body requirements for whatever passenger car production may be possible. Next week this column will outline situations of individual automobile companies as respects their internal plant problems in partial reconversion.

Iron and Steel Capacity and Production for Sale

AMERICAN IRON AND STEEL INSTITUTE — OCTOBER - 1943 (PRELIMINARY)

		Number of companies	Items	Annual Capacity Net tons	Production for Sale—Net Tons: Current Month: Total	Current Month: Per cent of capacity	Current Month: Shipments: Export *	Current Month: Shipments: To members of the industry for conversion into further finished products	Year to Date: Total	Year to Date: Per Cent of capacity	Year to Date: Shipments: Export *	Year to Date: Shipments: To members of the industry for conversion into further finished products
Steel Products	Ingots, blooms, billets, slabs, sheet bars, etc.	44	1	xxxxxxx	763,679	xxx		240,443	6,896,327	xxx		2,048,085
	Heavy structural shapes	10	2	5,412,580	345,064	75.0		xxxxxxx	3,175,537	70.4		xxxxxxx
	Steel piling	4	3	338,000	3,149	11.0		xxxxxxx	30,483	10.8		xxxxxxx
	Plates—Sheared and Universal	21	4	9,189,740	1,116,437	143.0		3,657	10,677,930	139.5		32,726
	Skelp	7	5	xxxxxxx	61,449	xxx		40,546	658,318	xxx		396,271
	Rails—Standard (over 60 lbs.)	4	6	3,629,260	178,558	57.9		xxxxxxx	1,564,847	51.8		xxxxxxx
	Light (60 lbs. and under)	6	7	309,690	12,004	45.6		xxxxxxx	141,721	54.9		xxxxxxx
	All other (Incl. girder, guard, etc.)	2	8	102,000	1,072	12.4		xxxxxxx	19,061	22.4		xxxxxxx
	Splice bar and tie plates	13	9	1,120,270	54,385	57.1		xxxxxxx	518,128	55.5		xxxxxxx
	Bars—Merchant	40	10	xxxxxxx	606,508	xxx		80,575	5,934,663	xxx		797,340
	Concrete reinforcing—New billet	15	11	xxxxxxx	28,900	xxx		xxxxxxx	350,283	xxx		xxxxxxx
	Rerolling	16	12	xxxxxxx	4,897	xxx		xxxxxxx	67,506	xxx		xxxxxxx
	Cold finished—Carbon	23	13	xxxxxxx	155,474	xxx		xxxxxxx	1,473,131	xxx		xxxxxxx
	Alloy—Hot rolled	20	14	xxxxxxx	243,174	xxx		31,279	2,544,920	xxx		354,604
	Cold finished	19	15	xxxxxxx	35,928	xxx		xxxxxxx	386,336	xxx		xxxxxxx
	Hoops and baling bands	5	16	xxxxxxx	5,294	xxx		xxxxxxx	75,597	xxx		xxxxxxx
	TOTAL BARS	63	17	14,719,525	1,080,175	86.4		111,854	10,832,636	88.4		1,151,944
	Tool steel bars (rolled and forged)	17	18	200,840	12,507	73.3		xxxxxxx	153,534	91.8		xxxxxxx
	Pipe and tube—B. W.	15	19	2,231,040	112,397	59.3		xxxxxxx	1,103,615	59.4		xxxxxxx
	L. W.	8	20	845,400	48,232	67.2		xxxxxxx	469,612	66.7		xxxxxxx
	Electric weld	8	21	1,149,250	90,902	93.1		xxxxxxx	866,122	90.5		xxxxxxx
	Seamless	15	22	3,082,400	196,143	74.9		xxxxxxx	1,824,857	71.1		xxxxxxx
	Conduit	7	23	190,000	3,662	22.7		xxxxxxx	47,470	30.0		xxxxxxx
	Mechanical Tubing	11	24	597,800	61,919	121.9		xxxxxxx	622,463	125.0		xxxxxxx
	Wire rods	22	25	xxxxxxx	104,308	xxx		16,937	1,001,653	xxx		188,738
	Wire—Drawn	41	26	2,356,550	168,837	84.3		2,118	1,655,917	84.4		44,609
	Nails and staples	19	27	1,116,640	62,740	66.1		xxxxxxx	679,261	73.0		xxxxxxx
	Barbed and twisted	15	28	482,280	20,735	50.6		xxxxxxx	203,625	50.7		xxxxxxx
	Woven wire fence	16	29	778,060	26,825	40.6		xxxxxxx	208,348	32.1		xxxxxxx
	Bale ties	12	30	128,420	7,587	69.5		xxxxxxx	92,525	86.5		xxxxxxx
	All other wire products	8	31	78,220	4,604	69.3		xxxxxxx	49,253	75.6		xxxxxxx
	Fence posts	11	32	112,065	7,445	78.2		xxxxxxx	38,075	40.8		xxxxxxx
	Black plate	10	33	339,700	38,421	133.1		-	278,915	98.6		-
	Tin plate—Hot rolled	4	34	483,620	-	-		xxxxxxx	10,597	2.6		xxxxxxx
	Cold reduced	10	35	3,841,340	151,331	46.4		xxxxxxx	1,830,796	57.2		xxxxxxx
	Sheets—Hot rolled	25	36	xxxxxxx	512,352	xxx		18,766	4,944,169	xxx		*170,998
	Galvanized	*14	37	xxxxxxx	70,289	xxx		xxxxxxx	677,812	xxx		xxxxxxx
	Cold rolled	14	38	xxxxxxx	138,911	xxx		xxxxxxx	1,242,967	xxx		xxxxxxx
	All other	16	39	xxxxxxx	29,098	xxx		xxxxxxx	298,882	xxx		xxxxxxx
	TOTAL SHEETS	28	40	13,497,570	750,650	65.5		18,766	7,163,830	63.7		170,998
	Strip—Hot rolled	22	41	3,201,690	138,666	51.0		17,000	1,287,457	48.3		158,430
	Cold rolled	39	42	2,059,740	96,928	55.4		xxxxxxx	975,289	56.8		xxxxxxx
	Wheels (car, rolled steel)	5	43	424,820	19,262	53.4		xxxxxxx	187,987	53.1		xxxxxxx
	Axles	6	44	453,470	14,192	36.8		xxxxxxx	134,370	35.6		xxxxxxx
	Track spikes	11	45	308,350	11,102	42.4		xxxxxxx	116,594	45.4		xxxxxxx
	All other	5	46	xxxxxxx	19,927	xxx		xxxxxxx	167,044	xxx		xxxxxxx
	TOTAL STEEL PRODUCTS	159	47	xxxxxxx	5,785,294	xxx		451,321	55,684,197	xxx		4,191,764
	Pig iron, ferro manganese and spiegel	26	48	xxxxxxx	796,050	xxx		388,721	7,552,313	xxx		3,740,045
	Ingot moulds	5	49	xxxxxxx	94,985	xxx		xxxxxxx	831,956	xxx		xxxxxxx
Iron Products	Bars	10	50	170,110	7,841	54.3		543	82,071	57.9		3,201
	Pipe and tubes	2	51	106,000	6,954	77.2		xxxxxxx	72,187	81.8		xxxxxxx
	All other	1	52	56,000	1,289	27.1		-	11,850	25.4		-
	TOTAL IRON PRODUCTS (ITEMS 50 to 52)	11	53	xxxxxxx	16,084	xxx		543	166,108	xxx		3,201

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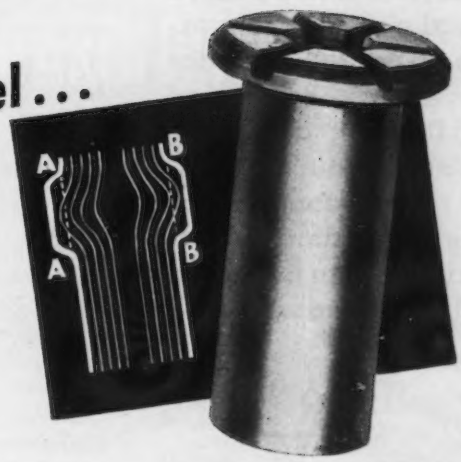

In spite of tremendous pressures and highly abrasive conditions in service—forged knuckle pins like this stay on the job longer because they are made from Carpenter Stainless. And note in the diagram that forging produced an even grain flow throughout, thus strengthening the thin sections at points AA and BB.

Faster Output

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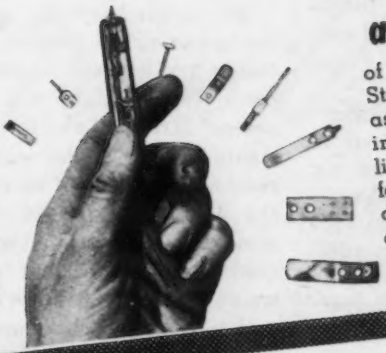

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of hardened Carpenter Stainless Strip helps to assure accuracy in making radio control parts like these. Another reason for using this strip is its dependable *uniformity*, coil after coil.

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L. W. MOFFETT

• Chrysler and Packard reveal size of reconversion task . . . Cost for Chrysler will be around $115,000,000 and for Packard about $10,000,000 . . . Recommendations regarding negotiation of terminated contracts made.

WASHINGTON—The Chrysler Motor Co.'s war plants cover 18,500,000 sq. ft. of floor space. The company also operates plants which are government-owned and cover an additional 11,000,000 sq. ft. of floor space.

Statistics on the size of Chrysler's war business was recently given to the Senate Truman Committee by K. T. Keller, president of Chrysler.

Chrysler's 20 plants are on 3300 acres. The government owns an additional 1100 acres on which its plants are placed which are Chrysler-operated. Approximately 106,600 employees call Mr. Keller boss.

The government has awarded Chrysler 195 contracts, of which 103 were completed, Mr. Keller told the Committee. The remaining 92 contracts in force were valued at $2,917,000,000. Completed contracts are valued at $264,000,000.

Of the contracts still in force, Chrysler has filled $1,850,000,000 worth of orders, leaving to be done $1,400,000,000 worth.

The company owns 20,665 machine tools, of which 17,209 or 89 per cent, were converted to war work. An additional 19,277 tools are government-owned and in use by the company.

Chrysler has about 10,000 suppliers working on subcontracts. An inventory of material in process taken in August revealed that all plants exclusive of the tank arsenal in Chicago had 73,183 tons of work in process. Mr. Keller estimated that at the end of the war business inventories would be worth about $230,000,000.

SPEAKING of the kinds of contracts held by the company, Mr. Keller said:

"I think, for instance, on tanks we have a backlog and schedule running us up to August or September, with new stuff coming along; trucks, we are pretty well fixed up for this year; and Bofors guns—we have been asked to step up the capacity on those; they want to give us more. . . . Then we have new stuff coming in that would take men for instance—this 20 mm. projectile ball and the 0.50 caliber bore, I understand are passing out entirely, but we have other things that we can put in that plant."

It will take an estimated $115,000,000 to convert Chrysler. Mr. Keller gave a partial breakdown as follows: $25,000,000 for getting the plants back in condition; $40,000,000 for new material inventories; and $12,000,000 for developing dealer organization and sales promotional activities.

Mr. Keller told the committee of the government's future plans for the huge Chrysler tank arsenal. Original plans were to make it a government arsenal after the war for tank experiments but, Mr. Keller said, that "only reached the phase of an expression of the desirable thing to do, and had some influence on the way the contract was written, but as far as I know, there is no definite decision that that is what the government is going to do."

MR. KELLER added: "With a great increase in production, the plant isn't set up as a well-integrated plant any more. The work of the tank arsenal has been distributed throughout our own plants. We have about 2,000,000 ft. of our own property on tank work, and 1,100,000 ft. in government property, so that the plant should be laid out: a layout study should be made and machinery selection made from the government-owned equipment now, that when put back in that plant would make a complete plant so that they could keep on with the development and manufacture of tanks in limited quantity."

When J. H. Marks, Packard Motor Co. vice-president, appeared before the Senate Post-War Planning Committee representing the Automotive War Council, he told the senators that it would cost about $10,000,000 to reconvert his own company. However, the armed services by contract had agreed to pay $2,500,000 of this charge.

MR. MARKS devoted a great deal of his time before the committee on contract cancellation problems connected with reconversion. He said:

"The way I vision that thing, a prime contractor may have several hundred or several hundred thousand subcontractors. The minute that they get this (cancellation) notice, that is called for in this contract, to stop, everyone of them will put their hats and coats on and beat it to the prime contractor and say 'How can I get my money quickly?'

"You are going to have a situation wherein our case, for example, if each one of the firms sends one representative to us today, there will be 350 of them sitting in our lobby the next morning wondering how they can get settled up.

"Now this negotiation of the termination of these contracts, not only with respect to materials but the amount the contractor should be paid requires the use of facts, so far as facts are needed.

"You cannot go out and look at a pile of steel bars and say 'Well, we will sell them to you for $1,000.' The steel bars should be counted, the analysis should be determined, the use to which the contractor has put the materials should be considered, and there is a bunch of facts on which he should determine what is a fair price."

Mr. Marks declared that if the price is too low, absurdly low, then of course the government should not sell it. If it is reasonable, it should be disposed of. That disposition should be final. It should not be subject to further review, unless "someone comes up and says that there was some crooked business about it, and it should be straightened out."

NEGOTIATION requires technical knowledge and experience, and business judgment with respect to the particular transaction involved, according to Mr. Marks. He said that a meticulous audit would only wind up as an approximation—"six auditors will come up with six different answers."

The following points were recommended by Mr. Marks:

1. **Settlement final except for fraud.**
2. **Advance disposal decision now for ex-**

Acceptance Proves Value

HEARTH PATCH is a war-born refractory that has made good.

Open hearth men, driving furnaces for more and more steel to meet war needs, called for an emergency patch material . . . something that could be dumped into large bottom holes to make strong, safe repairs with minimum loss of time. Hearth Patch was the answer.

Just how well Hearth Patch serves this purpose is demonstrated by its steadily growing acceptance. Month after month, the tonnage used increases. New customers are trying it, liking it, becoming regular users.

Hearth Patch is designed solely for emergency repairs. A fine-grained, fast-setting magnesite, it is intended to be thrown quickly, without slag addition, into deep holes while the furnace is still very hot. Thus properly applied and given a working surface of dolomite clinker, it consolidates into a dense repair. At the end of a campaign, such patches should be dug out and replaced with more permanent repairs of Ramix.

Our Service Engineers are prepared to assist your personnel in proper ways to use Hearth Patch and other Basic Refractories products—to help you make maximum savings in production time with good refractories.

BASIC REFRACTORIES, INCORPORATED

CLEVELAND, OHIO

BASIC FURNACE
REFRACTORIES

pected termination problems of each contractor.

a. Plant equipment to be purchased by contracts.

b. Material to be purchased.

c. Method of removal of material and equipment.

d. Acceptable methods of dealing with subcontracts.

3. Legislative confirmation of negotiated settlements.

4. Procurement agencies should have basic termination responsibility.

5. Decentralization of termination function to field offices, with right of appeal to Washington.

6. Administrative tribunal appeal procedures.

7. Single agency control over uniform policies.

8. Freedom from personal liability for contracting and disbursing officers who make settlements with contractors.

9. Reasonable investigations to be made before final agreements.

10. Direct payment to subcontractors in appropriate cases.

11. Prompt partial payments before presentation of detailed claims where settlement agencies believe advances can be made with reasonable safety. Over-payments would be considered loans. Payment of interest to contractors on delayed claims.

12. Government-guaranteed loans.

13. Immediate program for training government contracting officers and their investigators and accountants for termination procedures.

'44 Production Increases to Effect Specific Lines; WPB Continuance Seen

Washington

• • • **WPB Executive Vice Chairman** Charles E. Wilson's statement last week that the 1944 war production job is at least 20 per cent bigger than the 1943 job was taken to apply to certain lines of military output rather than to total production in all lines. This view was based on the fact that a shift in output is definitely underway while at the same time heavy cutbacks also are taking place, together with excess production in steel and other kinds of war materials.

Strength was given to this view by Mr. Wilson's statement to WPB Division directors.

The job for many months to come, Mr. Wilson said, is to produce munitions in an ever-increasing flow. He stated that as to facilities "we have practically everything in place; we have raw materials under control and although there are some bad spots as to manpower, in this field, too, things are in better shape than many are inclined to believe."

Mr. Wilson advised the division directors to disregard rumors concerning the reconversion job, pointing out that whatever plans might be developed, the execution of them would have to be carried out by an organization like WPB composed of men from industry.

The Office of Operations, he said, will require a somewhat revised structure to handle the new and harder job in the coming year. Meanwhile he has for the present taken over the position as Operations Vice Chairman, vacated by the resignation of H. G. Batcheller.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

Army and Navy Plan New Termination Branches

Washington

• • • **The War and Navy** Departments are reported preparing new methods of handling contract cancellations and surplus material disposal through the establishment of industrial readjustment departments which will cooperate with the OWM.

The War Department announces the combining of two Army Service Force activities, the contract termination branch and redistribution and salvage branch, into a new division to be known as the readjustment division.

The Navy has not yet announced its new division but Under Secretary Forrestal has issued a directive authorizing the appointment of additional chief of Procurement and Material for Industrial Readjustment. No very clear cut plans are in evidence yet.

Mr. Forrestal in a recent statement favored the cancellation of contracts and reconversion of plants which could most easily return to peacetime pursuits with termination coming last to government-owned plants.

•

Contract Termination Board Proposed by Senator Murray

Washington

• • • **Senator James E. Murray,** Dem. of Montana, is passing around for comment, to the war agencies interested, a new contract termination proposal.

The suggested legislation which if introduced and passed would incorporate standards to be followed by the procurement agencies in termination contracts and would set up a Contract Termination Board under OWM.

The board would set policies to be followed by the various agencies and issue regulations within a framework of legislation. It would be required to relate its activities to those agencies engaged in disposing of war surpluses and reconversion.

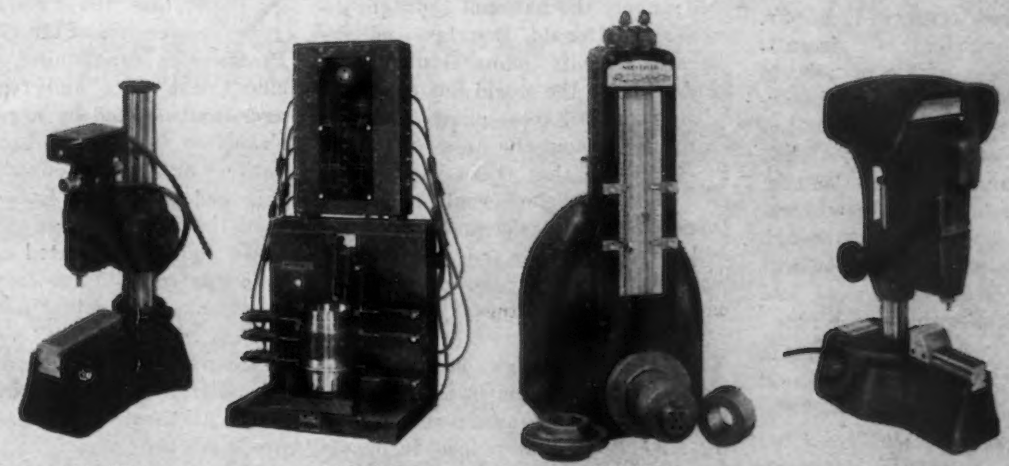
"To err is human" ... and costly!

Inexperience, ineptness, fatigue, ill-health, inattention, indifference—all are possible bugaboos when using fixed gages on extremely close tolerance work (i. e., checking to "tenths").

Scrap, wasted time, production slow-downs, faulty products—these are the high costs of rejecting good parts or passing incorrect parts as being good.

"Hangovers"—physical or mental—make no difference when using a Visual Gage, Multichek, Precisionaire, Electrichek or other Sheffield precision gaging instrument. Mechanical skill built into these gages eliminates the need for "top performance" individual skill to precisely and accurately inspect parts to "tenths".

Sheffield precision gaging equipment eliminates "human" error. Write for new Folder No. 43-1 and name of Sheffield Engineering Representative in your vicinity.



SHEFFIELD ELECTRICHEK | SHEFFIELD MULTICHEK | SHEFFIELD PRECISIONAIRE | SHEFFIELD VISUAL GAGE

THE **SHEFFIELD** CORPORATION

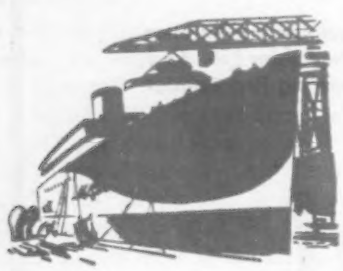
DAYTON, OHIO, U. S. A.

SHEFFIELD MASTER GAGEMAKERS

WEST COAST . . . .

OSGOOD MURDOCK

• Aircrafters deny extensive layoffs . . . Claim labor turnover still a problem . . . Union technical concessions may save $62 million on naval contracts . . . Negro auxiliary unions in shipyards create thorny problem . . . FEPC silent.



LOS ANGELES—These past weeks rumors have concerned lay-offs, and principally in aircraft. What started as a trickle of 2000 to be laid-off, in a few weeks had "snowballed" up to 14,000 workers in imminent danger of separation. While the harried War Manpower Commission was attempting to feed new workers into the production lines, through the equally harried U. S. Employment Service, the boys and girls were said to be being laid off in big numbers.

It positively isn't so, declare the authorities. "All plants still need workers for the production line," declares an official statement from the Aircraft War Production Council, representing the seven major airframe manufacturers on the West Coast. A few of the small aircraft firms have been able to release some factory workers as the result of completing contracts or greater labor utilization. We are still battling a turnover problem represented by an average of 20,000 persons leaving their jobs each month."

"There have been no major lay-offs that I know of," declares Brig. General Donald F. Stace, chief of the Western Air Corps Procurement Division. "The factories are simply streamlining their operations in an effort to obtain the full utilization from every worker. This has meant the transfer of some indirect workers (office help, etc.) to direct production."

Since warplanes have now been standardized very generally, and models are not now subject to so many modifications with resulting assembly line changeovers, there is no longer the need for so extensive an office and overhead organization to handle the paper work and procurement in connection with former changes. These so-called non-productive workers are now offered transfers from indirect to assembly line employment. Many white-collar workers have preferred to terminate rather than directly produce.

Practical manpower authorities in this area are now agreed that the accent should henceforth be on "keeping what we've got," halting turnover by improving working conditions, and accelerating production by better labor utilization.

Strangely the national spotlight directed on Donald Douglas and the largest aircraft manufacturing organization in the world has disturbed labor morale in these plants and generally throughout the area because of the inference that there would be a day when the "shop would shut up." Douglas officials insist that such a day will only dawn after the war has been won and they can find no one who wants any more planes.

WHEN Kaiser's shipyards at Vancouver and in the Portland district obtained an agreement with the AFL Boilermakers local to permit its members to do their own tack welding, a precedent was established which has now quickly spread to Puget Sound and which local authorities estimates will save $62,000,000 on current naval and maritime contracts, at the same time better utilizing manpower and relieving an acute shortage. A boilermaker is now free to work on any job within the jurisdiction of the union, provided he is qualified to do so. Because there was a shortage of welders that the union could not supply, and because the Boilermakers hold the principal shipyard contracts in the Pacific Northwest, this concession is of considerable importance. From an AFL union it sacrifices the vertical craft principle to the more expedient industry-wide principle.

With the concession came an increase in wage, applying to those affected by the interchangeability clause and now performing work entitling them to a higher ability classification than previously. It now seems that the recent long-drawn-out stabilization conferences in the shipyard labor areas have resulted in practical advances to eliminate technical restrictions and prohibitions that have slowed production and discouraged industry. Employed at the shipyards of Bethlehem and Marinship on San Francisco Bay are 1500 Negroes.

The boilermakers have an international policy which does not permit Negroes to become full voting members of the union but an auxiliary has been formed to Local No. 6, known as auxiliary Local A-4-1, wherein Negroes may obtain union standing by paying certain dues.

NOW that the President's Committee on Fair Employment Practices is functioning, with a Pacific Coast office and regional manager, and abetted by a so-called San Francisco Committee Against Segregation and Discrimination, Negro shipyard employees have refused to joint the auxiliary and thus be segregated and **discriminated** against.

In line with its agreement with the boilermakers, Marinship has already "pulled the time cards" and dismissed 90 Negroes and another 400 face dismissal if they do not join the auxiliary. All Negro shipyard employees are disturbed.

This "showdown" in the Boilermakers Local is probably the forerunner of other appearances of the same problem. At Portland where the Kaiser yard predominates, there is a region wide contract with Boilermakers Union No. 72 and the same situation exists. An auxiliary has been formed in Vancouver known as No. 32-A and Negroes have there been admitted under the same limitations. The President's Fair Employment Practice Committee held hearings last month, but as usual there was no conclusion, no decision and no settlement of the thorny discrimination, segregation and racial inequality issue.

a HARD and FAST rule

TO PRODUCE BETTER PRODUCTS AT LOWER COST

CATERPILLAR Tractor Company's progressive engineers use the "hard and fast rule" of TOCCO Induction Hardening to improve their products and cut costs.

On gears, for example, TOCCO's speedy, localized heating minimizes the distortion problem, permits *machining first*, then hardening . . . *real hardening*, uncompromised by the need for machining afterward.

Results for the 25.7" diameter, 275-lb. "final drive gear" of "Caterpillar's" big 17.5-ton D-8 tractor:

LONGER LIFE. TOCCO hardening applies heat-treatment quickly to wearing surfaces, minimizes distortion, permits maximum hardening of gear teeth and thus helps to reduce wear.

SAVES NICKEL. Use of plain carbon steel instead of alloy steel is saving 144,000 lbs. of scarce nickel per year.

CUTS TOOL WEAR. Fellows' shaper cutters had to be reground after four gears. Crown-shaping tools now last for hundreds of gears.

SPEEDS PRODUCTION. Heating time 90 seconds. Quenching time 34 seconds. Floor-to-floor time about 4 minutes per gear.

A far better product at lower cost. Aren't these *your* objectives . . . now and post-war? TOCCO engineers are at your service.

THE OHIO CRANKSHAFT COMPANY
Cleveland, Ohio

Briefly Told—

OPA Picks Five for Manganese Castings Group; Other News

• **OPA has established a manganese steel castings industry group which includes in its membership E. C. Bauer, Kensington Steel Co., Chicago; N. A. Enstrom, Pettibone-Mulliken Co., Chicago; W. L. Jackson, Frog Switch & Mfg. Co., Carlisle, Pa.; J. A. Kugler, Taylor-Wharton Iron & Steel Co., Highbridge, N. J.; E. A. Nist, American Brake Shoe & Foundry Co.**

•

• Production reports by the fractional horsepower motor industry for September showed a decline of $2,000,000 from the total of $35,000,000 worth of production of the previous month, according to WPB.

•

• **The backlog position of the portable conveyor industry increased from two and one-half months in May, 1943, to four and one-half months in November.**

•

• *Your Government wants your ideas and inventions which will help win the war. Smaller War Plants Corp., through the Technical Development Section at 226 West Jackson Blvd., Chicago, is set up to handle these new inventions and ideas. Already they have handled hundreds of them. One simple invention might shorten the war by months; another might save thousands of lives. If any reader of* IRON AGE *has an invention or idea that will help your Government, contact immediately: Smaller War Plants Corp., Technical Development Section, 226 West Jackson Boulevard, Chicago 6, Ill.*

•

• **The appointment of Charles Hook, Jr., as industry member of the National War Labor Board Airframe Panel was announced by the WLB Dec. 20. Mr. Hook, who is assistant to the president of the Rustless Iron and Steel Corporation, Baltimore, Md., has been associated with the WLB as industry member of various tripartite dispute panels for the past year.**

•

• **Benjamin J. Lazan, chief engineer of Sonntag Scientific Corp., Greenwich, Conn., an affiliate of the Baldwin Locomotive Works, has been presented with the Alfred Nobel Prize for 1943 for the most outstanding research work in any field of engineering. The prize was awarded for his paper on "Some Mechanical Properties of Plastics and Metals Under Sustained Vibrations."**

•

• *Plans for the establishment of a new iron ore research laboratory at Duluth, centralizing the research activities of Oliver Iron Mining Co., United States Steel Corp., subsidiary, were announced Dec. 3. A four-story building in west Duluth has been purchased and will be remodeled.*

•

• **Engineers of the Bonneville Power Administration in Washington have uncovered in wrought iron a capable substitute for war-scarce copper and aluminum electrical buses. According to J. A. Gerber, assistant engineer at Bonneville, "wrought iron need not be classified as an 'ersatz' material; there are many points in favor of using it for permanent buses."**

•

• *The new 18-cyl. air-cooled radial engine of 2200 hp., the Cyclone 18, built by Wright Aeronautical Corp., consists of two banks of nine cylinders each and has a displacement of 3350 cu. in. Improved cowling and its 55-in. diameter (same diameter as the nine-cylinder job) creates less drag than the original Cyclone which had less than a quarter of the engine's power. Aluminum alloy cylinder heads, nitralloy steel cylinder barrels, are used, and there is a steel crankcase which permits taking more power from the engine. Magnesium is employed in nose section and supercharger housings. Wright engineers designed a reduction gear system with very low ratio. At an average cruising speed the propeller turns at only 600 r.p.m.*

•

• **At Waukesha, Wis., the War Manpower Commission has had to allow 167 transfers from one essential job to another in a 60-day period. This was out of a possible 277 petitions received. Forty-three were denied outright and 67 had to be convinced they could serve the war effort best by staying where they were.**

•

• H. K. Porter Co., Pittsburgh, announced the receipt of a congratulatory message from Rear Admiral W. H. P. Blandy, U. S. Navy, Chief of the Bureau of Ordnance, Washington, for outstanding performance in the production of naval ordnance material.

COMING EVENTS

Dec. 6 to 11—19th Exposition of Chemical Industries, New York.
Dec. 8, 9, 10—National Association of Manufacturers, New York.
Jan. 10 to 14, 1944—Society of Automotive Engineers, Detroit.
April 2 to 5—The American Ceramic Society, Inc., Pittsburgh.
April 12 to 15—The Electrochemical Society, Inc., Milwaukee.

• ***An exhibit of furniture ideas for post-war homes will be held January in Grand Rapids, Mich., under the sponsorship of Grand Rapids Industries, Inc. Design experts in the glass, aluminum, steel, rubber, and plastics fields have been invited to submit ideas.***

•

• ***Patrol vessels to convoy troop and supply ships are coming from production lines just a little faster as a result of an outstanding suggestion which netted a $700 award to Herman Vander Nesse, Chicago. Mr. Vander Nesse, an employee of the Pullman-Standard Car Mfg. Co., suggested an arrangement for using clamps and levers to force a large ship plate over a form. The suggestion saved well over a hundred man hours per ship.***

•

• *A 16-mm. color film, with sound, showing the fabrication of ship stern frames, has been produced by Metal & Thermit Corp., 120 Broadway, N. Y. It is available for showing before groups.*

•

• ***The largest chlorine plant ever built as a single unit east of the Mississippi River was brought into production at Natrium, W. Va., by Columbia Chemical division of Pittsburgh Plate Glass Co., operators, and the H. K. Ferguson Co., Cleveland, industrial engineers and builders.***

•

• ***To provide more manpower for the vitally needed production of war materiel the number of men and women engaged in guard duties at privately operated war plants will be reduced, the War Department and the Navy Department have announced.***

•

• Amdt. 106 to MPR 136 is a collation of all amendments since the issuance of the regulation. This is to aid the machinery industry, and its 40,000 related establishments throughout the country. (Release No. OPA-3512)

. . . Cited for Awards . . .

• • • **The following companies** have been awarded the Army-Navy "E" for efficiency in war production:

American Bantam Car Co., Butler, Pa.
Atlas Powder Co., Kentucky Ordnance Works, Paducah, Ky.
Diamond Wire and Cable Co., Chicago Heights, Ill.
Electronic Enterprises, Inc., Newark, N. J.
George K. Garrett Co., Inc., Philadelphia.
B. F. Goodrich Co., American Anode, Inc., Akron, Ohio.
Hart-Carter Co., War Production Plant, Peoria, Ill.
Hayward-Schuster Woolen Mills, Inc., East Douglas, Mass.
Holtzer-Cabot Electric Co., Boston Plant, Boston.
Nubian Paint & Varnish Co., Chicago.
J. R. Simplot Dehydrating Co., Caldwell, Idaho.
Southern Alkali Corp., Corpus Christi, Texas.
Western-Newell Mfg. Co., Freeport, Ill.
Simmons Machine Tool Corp., Albany, N. Y. (second white star)
Bendix Aviation Corp., Eclipse-Pioneer Division, Teterboro, N. J. (star)

Fatigue Cracks . . .

BY A. H. DIX

". . . And 1,269,983!"

• • • On the slightest provocation we boast that most of the questions addressed to the brains department by loving readers are answered. Of course, a few require us to dust off the ouija board, as, for instance, the one about the world's annual loss through corrosion, in dollars at current rates of exchange.

Another that sent us into the silences was, "How many rivets in a battleship?" We came to with 1,269,983, although we admitted at the time that we might be out a half dozen one way or the other, as it is pretty dark and stuffy down there in the bow end of the hold. But now we have a check on that estimate through a figure given out by the superintendent of the Newport News Shipbuilding & Drydock Co., which is building the new cruiser, the *Houston*. He says it will have about 650,000 rivets.

The Houston is about a 10,000-ton ship. A battleship weighs about three times as much, so twice as many rivets ought to be about right. It satisfies us, anyway.

Visibility Zero

• • • We will predict the past and will gladly risk a leg chasing after an intangible with our butterfly net, but our crystal ball is so badly nicked from being used so long as a paper weight that we can't do a thing for the Ohio manufacturer who wants to know how much finished steel will be made in the twelve months after the war ends, and "how much will be bars, plates, sheets, and so on."

Our problem, Mr. Anthony, is this: Should we come clean and tell him that he can get as good a guess from the tea leaf reader with the 65c lunch, until it is known whether the postwar taxing policy will be hard or soft, whether a workable system will be devised to finance exports, and what will be done about public works in the event of heavy unemployment? Before we put on our Delphic oracle costume we would also like to know about the rubber situation, as it has a bearing on the business of the automobile industry, which is the steel people's ace peacetime customer.

Luce Terminology

• • • At Middlesbrough and Sheffield and Cardiff the open hearths rear their gaunt chimneys to the sky . . .
—*Fortune, Nov. '43, page 135*

To *Time* a bessemer converter is a blast furnace. To *Fortune* a blast furnace is an open hearth. The Luce people's collective mind is a pother of smelters, open hearths, cupolas, bessemers, blast furnaces, and blow torches. Once we tried to straighten them out, but got a polite brush-off in the form of a "our - readers - don't - know - the - difference - so - why - should - you - get - excited - about - it" acknowledgment.

But if this is seen by the young lady in *Time's* library who calls up every now and then, will she tip the *Fortune* staff off to the fact that an open hearth has hardly any more chimney than Ann Corio has drapery at the beginning of the fourth chorus.

Stopper

• • • *Strip Act* — Very Unpopular with the Axis! — Superior Steel Corp.

Mr. Kschadow Piles 'Em Up

• • • Into the postwar project pot, we toss this one sent to us by a forward-looker who signs himself Fred Kschadow:

> The profile of the railroad is too small. Up to the year 2100 the population will double itself. A third world war is unavoidable. After the war millions will be without work.
>
> For these and other reasons the cross sectional area of railroads has to be increased from 100 per cent to 400 per cent. New land is not required for a line which is to be double tracked. Today it can be rebuilt into a single track road of the super-type.
>
> The bureaucrats in the United States do not advocate my project because millions have been spent for roads. The same was said 110 years ago in the British Parliament. As the *Railway Gazette* (London) of Apr. 17, 1943 states, technicians in Germany are preparing a railroad project with a track width of 12 ft.
>
> This does not correspond to my ideas. A super-railroad is called for.

Mr. Kschadow encloses a sketch which shows a railroad of the four-decked type, like a club sandwich. If it comes to a choice between Mr. Kschadow's idea and the 12-ft. gage track, we hope Mr. K. wins, as the thought of locomotives big enough to span the track scares hell out of us.

Aptronym

• • • Charley Post, who sees to it that nothing of importance that happens 'round Chicago way escapes you, saw this sign, he says, when he was returning from a trip to Moline last week:

MILK COWS FOR SALE
H. M. HURD

Life After Axe

• • • The Cleveland member of this page's loyal army of eighteen readers sends us a newspaper clipping announcing that Dr. Bird of the Church of the Covenant preached on Thanksgiving morning. "The topic," he adds, "was undoubtedly 'Reincarnation.'"

Green Hands At Keyboard

• • • As evidence of the fact that the new crop of typists was not tree-ripened before plucking, Osgood Murdock, your Pacific Coast reporter, sends us a letter he received, addressed "Mr. Age Iron." We got one the other day addressed to "Mr. A. Chilton Publication."

Blurb

• • • Speaking of green help, the post office people have, as you know, adopted the continental custom of establishing postal zones in the larger cities and requiring that the zone number be made part of the address. This enables inexperienced sorters to route mail quickly.

More than a quarter century ago we instituted zoning of subscribers' stencils, as a means of obtaining quick delivery. In some of the larger cities there are as many as 40 to 50 subdivisions.

It is, therefore, unnecessary that the zone number be on your stencil, as the sorting has already been done by us. We think of practically everything.

Language Enrichers

• • • No subscriber to the constrictions of basic English is the brains department. As examples of the use of verbs still in the original cellophane, we quote this from a recent Washington dispatch by Leon Wesley Moffett:

> . . . the Committee on Expenditures had ***"St. George'd"*** White House attempts to keep Congress out of the surplus war material question.

And Stanley Howard ("Assembly Line") Brams':

> ***Cannibalizing*** of damaged planes—stripping them of unharmed parts—accounted mainly for the reduction . . .

Puzzles

• • • If you crave to know how last week's vintner measured out 10 gallons in 16 steps, write us and we will copy the answer out of our puzzle book and send it to you. This should take you less than 10 minutes:

> *From among 36 prisoners there were 6 whom Caligula wanted to punish. He wished to free the rest if it could be done with an appearance of impartiality. He arranged all 36 in a circle and punished every tenth. In what places did he put the 6 victims?*

LOOK TWICE!

IT'S *MORE* THAN A SCALE

SURE it's a scale—a *good* one! NO better weighing machine is made. But this Fairbanks-Morse Dial Scale with Printomatic is more than a scale—and fast, accurate weighing is only one of the jobs it does! For modern Fairbanks-Morse Scales are *tools* that *speed* production.

They keep books, making printed records of incoming and outgoing shipments. They "read" themselves and *print* the weight record on a ticket or tape. They control batching. They measure paint ingredients. They guard secret formulas. They count small parts. They save time and money by preventing human errors. They can be fitted into your production flow to eliminate duplication of effort and accelerate output. If we can't show you how—that's our loss—not yours. Fairbanks, Morse & Co., 600 S. Michigan Avenue, Chicago, Illinois.

FAIRBANKS-MORSE

DIESEL ENGINES
PUMPS
MOTORS
GENERATORS
WATER SYSTEMS
SCALES
STOKERS
FARM EQUIPMENT
RAILROAD EQUIPMENT

FAIRBANKS SCALES

Scales

Dear Editor:

RIFLING BROACHES

Sir:

We are interested in obtaining further information regarding the manufacture of 20 mm. gun barrel rifling broaches.

E. ELLIS,
Metallurgist
Eighty-Two Factory,
Hawthorn, Wilts, England

● See page 52 of the June 19, 1941 issue for an article on the design of rifling broaches developed at the Illinois Tool Works, 2501 N. Keeler Ave., Chicago.

Lapointe Machine Tool Co., Hudson, Mass., has developed a method of rifling large bores by broaching, using a small disk or wafer. Thirty or more of these wafers varying in size by a few .001-in. are pulled through the bore successively.—Ed.

METAL FURNITURE

Sir:

We are interested in obtaining information on the manufacture of metal furniture.

W. C. B.

● See "Design Possibilities for Square Welded Tubing," by H. S. Card, technical secretary of the Formed Steel Tube Institute, 1621 Euclid Ave., Cleveland—page 48 of our July 17, 1941 issue.—Ed.

STAINLESS STEEL SUBSTITUTE

Sir:

A manufacturer in the Denver area inquires: "We are manufacturers of turbine pumps, and would like to find a suitable and less expensive steel shafting than stainless steel to use in the bowl assembly of our turbine pumps. It must have non-corrosive properties and be somewhere comparable to carbon steel in rigidity and durability. It will have to be machinable, but it does not have to have the bright finish of stainless steel. The shaft will operate in an oiled bronze bearing approximately 4-in. bearing surface every 5 ft. at speeds ranging from approximately 600 to about 1200 r.p.m."

LESLIE L. WAYMIRE
Technical Advisory Service,
Smaller War Plants Corp.,
Continental Oil Bldg.,
Denver 2

● SAE 4140 chrome molybdenum steel has been used for oil well piston rods and slush pump shafts. but it has no greater corrosion resistance than any of the common alloy steels. There would be some saving in substituting a straight chromium stainless steel, say the AISI 403, containing 13 per cent chromium, as the base price for this material is 5c lb. less than 18-8.—Ed.

DEEP FILLET WELDING

Sir:

Your Sept. 30 article on deep fillet welding was very interesting. The tests and development of this particular welding technique as applied to ship construction at the California Shipbuilding Corp. through the efforts of members of our supervisory staff have resulted in labor and material savings. Undoubtedly, this information will be of interest and assistance to many others connected with similar production operations.

JOHN A. McCONE,
Executive Vice-President
California Shipbuilding Corp.,
Wilmington, Cal.

TOOL STEEL DIRECTORY

Sir:

I have recently seen your Tool Steel Directory and would appreciate receiving two copies. What is the cost?

L. F. ROTH
General Motors Corp.,
Detroit Diesel Engine Div.,
13400 West Outer Drive,
Detroit

● The new edition of The Iron Age Directory of Tool Steels is just off the press. Price $1.—Ed.

KAISER'S PHENOMENON

Sir:

We all recognize Henry Kaiser has "something on the ball," but what about the "Bess" which "continues to require 25,000 tons of scrap steel per month?"

If it is in IRON AGE, it must be authentic and the above remarks are published on page 88 of your Oct. 28 issue.

I have watched ore, coke and limestone going into the furnace; but, if it really consumes 25,000 tons of scrap per month as well, it must be injected through some mysterious passage not vissible to the naked eye and thus kept a guarded secret locked in the bosom of the Kaisers.

N. E. DAWSON
Soule Steel Co.,
6200 Wilmington Avenue,
Los Angeles 1

● Our report was wrong. We meant to state that the 25,000 tons were to be used by the Kaiser mill, both in the open hearth and in the blast furnace, and this figure was mentioned primarily to show that this plant is drawing rather heavily on Pacific Coast supplies. For "Bess" alone to use 25,000 tons of scrap would be quite a feat, even though the Kaiser Co. is operating it.—Ed.

BULL'S-EYE

Sir:

With many others I was most impressed by your Nov. 11 editorial, "Pearl Harbor—Plus." After showing it to a number of my friends, they requested a copy. Can you send me about a dozen? Congratulations on this most effective editorial.

P. M. LORENZ,
District Sales Manager
Inland Steel Co.,
Broadway & Olive Streets,
St. Louis 2

HIGH SPEED MILLING

Sir:

The article on high speed milling appearing on page 74 of your Oct. 14 issue is the best and most factual article on this subject we have so far seen. Is it possible for us to obtain 100 copies for distribution among our foremen and certain select personnel in our plants?

L. F. WILLIAMS,
Assistant Secretary
Cooper-Bessemer Corp.,
Mt. Vernon, Ohio

● Reprints are being made.—Ed.

CORRECTION

Sir:

Your issue of Nov. 18 gave us a good deal of assistance by complete publication of the list of aluminum and magnesium producers and fabricators, beginning on page 128.

In reviewing this list, we notice one major error which was probably our fault. On page 140, the classification at the top of the page should have been headed "Aluminum Distributors" rather than "Magnesium Distributors." As far as we know, there are no commercial magnesium distributors at the present time.

ALBERT BUTLER, Chief,
Accounting & Statistics Section
Aluminum & Magnesium Div.,
War Production Board,
Washington, D. C.

DEVELOPMENT OF TIN PLATE

Sir:

I read with interest the article, "Development of the American Tin Plate Industry," in the Nov. 18 issue on page 44. Where can I get further information on the development of the stainless steel sheets and strips in America?

GEORGE B. FURMAN
Robertson, Furman & Murphy,
1316 L Street, N.W.,
Washington, D. C.

● Although about eight years old, "Stainless Steel," edited by E. E. Thum, and published by the American Society for Metals, Euclid Ave., Cleveland, will give the basic information desired.—Ed.

COPPER BRAZING

Sir:

Please send us your article on copper brazing for mounting high speed steel tips on low alloy steel. We are using several different methods with very good results and are always looking for something new if better.

E. W. MARTIN,
Tool Reclamation Engineer
Curtiss Wright Corp.,
Columbus, Ohio

● "Two Methods of Brazing High Speed Steel Tips" is reprinted in our booklet, "How to Get Maximum Output from your Cutting Tools," price 60c.—Ed.

COMPARABLE ELECTRODES

Sir:

Do you have reprints of "Comparable Arc Welding Electrode Tables" published in your May 13, 1943 issue?

C. E. PHILLIPS
C. E. Phillips & Co.,
2750 Poplar Street,
Detroit

● Yes, at 5c a copy—Ed.

A TINY light flashes. Immediately, a massive machine starts operating. One little tube supplies the impulse. But *springs are the muscles* which accurately control the mechanical motion—tireless muscles, capable of working continuously, without strain.

To give the precise, instantaneous action necessary for gaining full value of electronic control, such springs must be designed for the specific application—and all factors bearing on their use scientifically evaluated.

Muehlhausen engineers have solved thousands of spring problems which arise with unusual applications—by the thorough study they make of all operating conditions, and their many painstaking tests to prove that each design is *right.* An assurance of greater latitude in the design of new and better electronic products.

MUEHLHAUSEN SPRING CORPORATION
Division of Standard Steel Spring Company
817 Michigan Avenue, Logansport, Indiana

This Industrial Week . . .

- ***Invasion Craft and Landing Mat Programs Speeded***
- ***Swapping Machine Tools for Raw Materials Gains Favor***
- ***Steel Union Wage Demands Stagger Industry Executives***

DIVERSIFIED trends are more apparent than ever this week in the metals and metalworking industries. Some of the slack created by military cutbacks has been taken up but in general the relationship between supply and demand in steel, aluminum, magnesium and copper continues easier than at any time since Pearl Harbor. New layoffs at some war goods factories have come to light, yet government officials insist the manpower shortage still is tightening. Contract cutbacks involving as much as three billion dollars for the War Department alone are visualized by certain Washington authorities as likely to materialize in the next few months, prompting labor leaders to map a concerted drive to return to the 40-hr. week as cancellations take place.

In steel it appears that the excess of ingots has undergone no appreciable diminishment. One other trend of a different nature in the industry is the probability that steelmakers will be unalterably opposed to union demands for higher wages and other concessions, which will put the demands speedily before the War Labor Board. The opinion expressed by B. F. Fairless of U. S. Steel Corp., that higher employment costs must be matched by higher steel prices, is held universally through the industry.

Meanwhile, machine tool users and sellers were given food for thought by a significant address in New York by Senator Truman, who revealed that WPB Chairman Donald Nelson had suggested "privately" to the Truman Senate Committee that it would be very desirable if appropriate arrangements could be made with foreign countries which will require them, particularly Russia, to trade surplus machine tools for stockpiles of strategic materials such as manganese, tin, nickel and chrome. This movement is said to have gathered considerable force in government and trade circles as well as in Russia.

ASIDE from a demand for a 17c. per hour increase for all wage earners in the steel industry, the union with an eye toward post-war conditions proposes among other things a separation wage payment for closed plants, a weekly wage guarantee for the life of the new contract, the elimination of geographical wage differentials, and a request for the retention of wartime wage victories involving double time for the seventh day worked, time and a half for the sixth or seventh day even though the employee does not actually work previous days, etc.

The union demands would shatter the "Little Steel" formula. The various provisions in total would cause the steel industry to make an additional annual outlay of approximately $260 million to $280 million. The United States Treasury Department would absorb roughly 75 per cent of such a wage cost, since wage payments are made before taxes.

Inventory reductions by some steel consumers constitute a factor of importance currently. On the other hand, an increase has been noted by steel sellers in "forward orders" for civilian items, which steel companies are allowed to accept, but which may not be put on order books or rolling schedules until allotment numbers and approval are granted by WPB. Incidentally, the demand for steel for civilian output is helping WPB's redistribution program, since under certain conditions excess steel may be obtained.

All indications point to continued tightness for weeks ahead in flat rolled steel, which is heavily in demand for shipbuilding. The invasion craft program is being pushed urgently with special priority assistance in an attempt to speed delivery schedules for next Spring and Summer by about two months. This will cause yet to be determined adjustments in the plate requirements of the Maritime Commission and the armed services, according to a WPB spokesman. Army, Navy and Maritime have recently agreed to readjust plate demand schedules to make available an additional 100,000 tons of plates in the December-January period. Since the three big plate users require 80 per cent of the entire plate output, civilian claimants such as the railroads and oil companies may be required to sustain a jolt also because their needs are held to be less essential.

MARITIME'S promised 1,662,000 tons of plates for the first quarter will undoubtedly be shoved lower, but just how much will be taken for landing craft has not as yet been decided. One thing seems clear, though, those plate users who got their plates from the continuous strip mills are to suffer most.

The biggest of the new craft will take 1000 tons of plates.

For the Record: Stalin's Praise

. . . One of the finest tributes paid to American industry came from Premier Stalin during the recent Teheran talks. In a toast he said: "Without American production the United Nations could never have won the war."

News Highlights in This Issue

The landing mat program for 1944 has been revised to require approximately an additional 300,000 tons of sheets. Practically all orders have been placed, or will be placed soon, for the first half, and arrangements are now being made to set up schedules for the last half of 1944. It is estimated that about 600,000 tons of sheets will be utilized in the landing mat program during the first half of 1944, and about 550,000 tons for the second half of 1944. Some orders have already been placed with steel makers for the last half of 1944 requirements, although most of the tonnage for that period is still to be placed.

Relaxation of governmental controls, notably limitation orders, has been going forward for two weeks now. Stainless steel, manganese, steel, copper, brass, aluminum and other materials have been affected in varying degrees by orders issued during the past week, mostly pertaining to small changes.

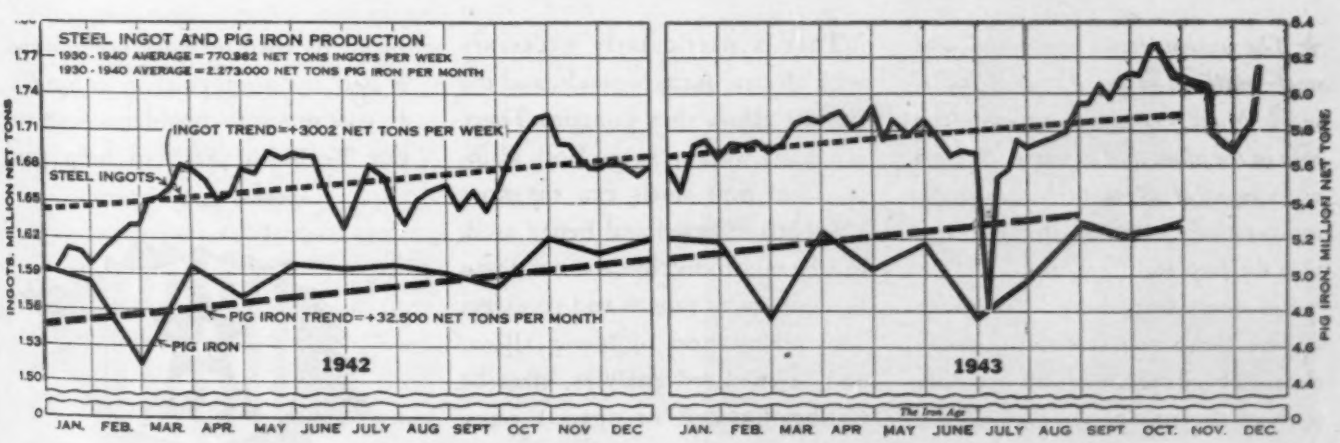
ON the raw material front, there now seems to be no immediate danger of a steel scrap or iron ore shortage. While the steel operating rate is not expected to decline sharply over the next few months, neither does anyone look for a new peak in production of steel ingots. The heavy demand for bessemer steel, which was apparent a few months ago, has fallen off to some extent. The sum total of these few items means that bessemer steel capacity will probably drop off several points in the next few months, electric steel capacity operations more than that, while open hearth production is expected to change less than the other two. The measuring stick will be the size and distribution of the excess ingots now being made. Two open hearths in the St. Louis area are down due to the reduction in the armament program.

A sharp dip in down-lake iron ore shipments during November resulted from a combination of bad weather conditions and the fact that many of the vessels in the ore trade have gone over to hauling grain. Only 6,940,503 gross tons of ore were delivered at lower lake ports during the month, as compared with 11,612,542 tons shipped in October. Total shipments this year to Dec. 1 amount to only 83,655,340 gross tons; with very few days left during December when the lakes will be navigable from the upper shipping ports. All loading has ceased in the upper lake ports except at the Great Northern Docks at Superior and the Duluth, Mesabe & Iron Range Railway Co. docks at Two Harbors and Duluth. Total ore shipments downlake this year will in all probability range between 84,200,000 and 84,300,000 tons, some 2,500,000 tons short of the goal of 86,500,000 gross tons. There is little fear that there will be an acute shortage of ore before shipping opens up on the lakes in 1944. Ore stocks at the close of the year will be close to 40,000,000 gross tons, and with a lake season starting even as late as April 15, this would easily permit the average monthly consumption of close to 7,000,000 tons.

Stainless Prices Probed; Other Sidelights of the Week

● ● ● According to an announcement at Washington, the Department of Justice has served subpoenas on makers of stainless steel, made returnable before a Grand Jury in Federal Court at Newark, N. J., on Wedneday of the present week. It is said that the action against the steel companies alleges maintenance of fixed prices. Serving of the subpoenas, it was said at the department, will be followed by an investigation. The subpoenas were signed by Posey T. Kime of the Anti-Trust Division. The case is in the charge of Herbert Berman, counsel in that division.

A remark at the warehouse industry advisory meeting in Washington last week to the effect that there are currently around 6000 tons of surplus tool steel, brought the retort from an Army man that a great deal more than that is now excess . . . The trend toward inventory reductions on the part of steel users may be checked abruptly if talk of higher prices persists . . . J. L. Block of WPB explained at a rccent steel advisory meeting that aircraft despite the fact its program is increasing has a smaller carbon steel allotment for first quarter because of a change in jurisdiction over drums . . . It is estimated that there may be excess electric furnace capacity of about 200,000 tons a month during first quarter . . . Employees of the Pencoyd Plant have been notified that it will be shut down on Dec. 31. If all workers leave before that date, the plant will be closed before. A Chicago firm has contracted for the demolition of the structure . . . Reflecting the shortage of malleable foundry facilities, DPC has announced two large contracts aimed at raising production. One involving $3,360,000 has been made with Lake City Malleable Co., Cleveland, for facilities in Ashtabula County. The other involving $415,000 was made with Fort Pitt Malleable Iron Co., Pittsburgh . . . Airplane production in the U. S. totaled 8789 units in November, exceeding October by 427 planes . . . Up to Dec. 1, 25,284,387 deadweight tons of merchant shipbuilding had been completed in one month less than two years, exceeding the 24,000,000-ton goal of new ship construction set for 1942 and 1943, according to Rear Admiral H. L. Vickery. Some 1,692,700 deadweight tons of this were delivered last month . . . Numerous open hearths, blast furnaces and mills of Jones & Laughlin Steel Corp. set new records of their own in November. United States Steel Corp. subsidiaries have shattered more than 2000 production records in producing 60,000,000 tons of steel since Pearl Harbor. A new ingot production record was established in October by the Youngstown Sheet & Tube Co., when 365,383 net tons were produced to surpass the previous record made in August by 3888 tons.



Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
December 2....	102.0	103.0	95.5	93.5	88.0	99.5	95.0	99.0	98.0	95.0	103.0	112.0	95.5	99.0
December 9....	101.5	103.0	96.5	93.5	89.0	99.5	99.0	99.0	98.0	95.0	104.0	108.0	101.0	99.0

OWI Photo by Palmer, in an Allegheny Ludlum plant.

Save . . TO PRODUCE MORE

★ *The nation needs scrap iron and steel—millions of extra tons of it this year. Make your clean-up complete, both in the plant and at home. Subject every pound of idle metal to the searching question: "Is it absolutely essential that we keep this?"*

But don't stop there! Rounding up the scrap and instituting more thorough salvage methods are only part of the job of conserving the nation's resources. Start at the beginning and make better use of *new* steel . . . aim to get more finished products out of it, with less waste.

That is particularly necessary with electric-furnace steels, and the critical alloys they contain. There are many ways to save. Both stainless and tool steels can be more efficiently selected and better used, to step up production and cut down the amount of rejects and spoilage. The substitution of lower alloys, and of standard analyses, sizes or finishes instead of special ones, all offer good opportunities to save.

Right now, do your share to increase the nation's scrap stockpile. And for the duration, avoid waste in all its forms—*make every pound of steel and alloys go as far as possible.* If you run into problems, call on our Technical Staff to help you.

ADDRESS DEPT. I.A.-13

AL
STEEL FOR THE NATION'S WELFARE

Allegheny Ludlum
STEEL CORPORATION
BRACKENRIDGE, PENNSYLVANIA

A-8866 . . . W & D

NEWS OF INDUSTRY

Plan for Trading Surplus Machine Tools to Other Nations In Return for Vital Materials Gaining Favor, Truman Indicates

• • • **Addressing** the Society for the Advancement of Management in New York last Friday, Senator Harry S. Truman of Missouri, revealed that WPB Chairman Donald M. Nelson has suggested "privately" to the Truman Senate Committee that it would be very desirable, if appropriate arrangements could be made with foreign countries, that will require them, particularly Russia, to trade surplus machine tools for a stockpile of basic materials such as manganese, nickel, tin, and chromium. This movement is said to have gathered considerable force both in Government and trade circles as well as in Russia.

Senator Truman, who discussed problems of inventories and expanded facilities and their relation to postwar planning, told the Society the United States has used great quantities of these raw resources, during the war, and that for purposes of national safety, it would be very desirable to create and immobilize huge reserves of such materials for use only in times of emergency.

"They would be more valuable to us than the huge stocks of gold at Fort Knox or a surplus of machine tools which are not needed and each year will be gradually becoming obsolete," the Missouri Senator said.

The Senator declared that the extent of management's success in meeting the problem of conversion from war production will determine whether this nation will have prosperity after the war. He said that, "Like most of you, I am confident that everything necessary to establish a prosperity beyond anything that we have ever had before is available to us." Supporting this statement he cited the hundreds of modern factories that have been built, their equipment with the most efficient tools and the training of millions of men and women to operate the tools. Also, he explained, new materials and new processing of manufacturing have been developed and capacity has been expanded to produce in large quantities materials that formerly were relatively rare and costly.

The Senator said that his committee has examined and reexamined projects to increase basic materials with the hope that they might be able to furnish a plentiful supply of cheap raw materials that business could convert into new and better and cheaper consumer goods.

"**If business** can do this," said the Senator, "we can continue to lead the world in industrial progress, and can continue to pay the highest wages for labor in the world.

"Fundamentally, this can only be done by producing the best goods in mass quantities at the lowest costs, so that there will be sufficient employment and purchasing power to assure wide-spread distribution, among all our people, necessary to effect a sound and healthy economy.

"Everyone agrees with this objective, but to achieve it, there must be cooperation and hard work by Government, business and labor. I believe that the objective can best be achieved by the Government determining, as soon as possible, its policy on certain fundamental points in order that business may know the conditions under which it will have to operate." Within those standards, Senator Truman said, business should be left free to make its own determinations. He insisted that business must not be regimented because to do so will stifle progress.

Another postwar problem, the Senator said, is that it is necessary to set up a satisfactory procedure for the quick and fair termination of contracts with as much advance notice of termination as possible.

Turning to the matter of inventories, it was pointed out the Government will possess huge stocks at the end of the war. He said that if the quantities are very large and the job of marketing them not skillfully handled, the markets and the confidence of business may be so seriously disturbed as to retard conversion from wartime to peace time production.

Leading to the suggestion of trading them to Russia and other countries, Senator Truman said that the problem of machine tools surpluses will be particularly acute. He pointed out that steps should be taken now by the Government agencies to determine which of these tools the Government wants to keep after the war.

"The rest of the tools should be classified into their several types and kinds and a fair price determined by types and kind," said the Senator. "Those prices should be the same irrespective of the agency which now holds title to the tools, and the job of determining the appropriate prices is one that I believe the WPB could profitably take up now with the price determining agencies. The companies operating these tools for the Govern-

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HEAVY ARTILLERY IN AIRCRAFT: *This is a B-25 Mitchell Medium Bomber, built by North American Aviation, Inc., Inglewood, Cal., with a 75-mm. cannon in its nose.*

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ment should be given a reasonable opportunity within which to indicate whether they desire to acquire the tools, after which the tools, their prices and location should be listed by WPB and made available for purchase by anyone desiring them, subject to delivery as soon as they are no longer required for war production.

"**This procedure** would assure that the Government sets a fair price even though it would be substantially less than the inflated cost of producing the tools in war time, and would prevent the tools from being sold, in mass lots, to speculators who might keep them from being used in production.

"Also, many established concerns would be able to modernize their production facilities, and to plan new processes of manufacture now with the knowledge that the necessary tools would be available when needed."

To convert the plants from peace work to war work, it was necessary, in most cases, it was pointed out, that the machine tools be rearranged and frequently that they be taken to different buildings. The Senator told the society that it will not be possible to resume production until the last item of Government material has been made and the maufacturer is free to remove the tools which the Government furnished him, and to rearrange his own tools. In some cases, it was explained, some of the tools that were formerly key tools were not used by him in war production and were sold or leased to others. They will have to be re-acquired or replaced.

"The jigs and fixtures for items of war production will, except in rare instances, have no value because even if we should be so unfortunate as to become engaged in another war within twenty years, the changes in war material will be such as to require new jigs and fixtures, and to make it unprofitable to warehouse and store those we now have." the Senator said. "The procurement agencies should determine now those that they want to retain, and upon the termination of war contracts, the manufacturer should be authorized to scrap them for Government account with a minimum of red tape.

"**General** instructions should be prepared for manufacturers telling them how to handle Government equipment. Valuable inventories and tools should be adequately cared for in warehouses, if readily available.

"Another problem which faces business is that of obtaining adequate working capital with which to finance the lag between the time when plants are being tooled and the time when finished goods can be delivered and the payment therefore received.

"After this war, we hope to have a civilian business very much greater than that during the pre-war peace time years. Yet the working capital of our corporations is geared to a peacetime economy which, for the five years 1935 through 1939, averaged only about 82 billion dollars per year. Some corporations have been able to improve their financial condition during the war. But by-and-large, taxation and renegotiation and the efforts of the procurement agencies to prevent excessive profits have prevented corporations from greatly increasing their working capital at the expense of the Government.

"Corporations will find that their marketing organizations and practices will have to be modified substantially. Others will find that it will be necessary for them to carry the cost of production for a longer period than they have previously been accustomed to. Some will be new businesses which had little or no pro-war experience or marketing organizations.

"**All this** will require additional working capital which should be obtained so far as possible through the sale of bonds and stocks to private investors who have confidence in the private organizations and are willing to invest in their future. To the extent that private banking has the facilities to bring such investors and the corporations together, it should be encouraged to do so. Measures to expedite and facilitate this should be considered and adopted where consistent with the protection of the investing public.

"To the extent necessary, and only to the extent necessary, the Government should supplement private banking where private banking is not able to do the job, but should not try to supplant it or to place the Government in control of business.

"**It is vitally** important that the conditions upon which private and government loans can be obtained should be determined as soon as possible.

"In general, I believe that the corporations which we relied upon for the production of war goods and which made good records in such production, ought to be regarded as worthy of financial assistance through loans for working-capital purposes, so long as care is taken to provide practical banking standards for the protection of the Government, and to prevent favoritism or discrimination in the distribution of funds.

"Another important problem facing business is that of the acquisition, by lease or purchase, of plants and facilities erected for the war program at the expense of the Government.

"Some companies have options to acquire the plants and facilities operated by them, and consequently are now in a position to determine whether they want them. But many contracts do not contain option clauses. In such cases, it will be necessary for the Government to determine the conditions under which it will sell or lease the plants and facilities. This should be done as soon as possible. In determining these conditions, care must be taken to make sure that no gift of Government-owned facilities is made to favored corporations."

THE CASABLANCA: ***The newest type escort carrier is this baby flat-top. Ships in this class represent a portion of the 40 new aircraft carriers which have been added to the fleet in the last 11 months.***

Steel Union's Demands Include Provisions For Era after War Ends

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By TOM CAMPBELL
Pittsburgh Regional Editor

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PHIL MURRAY *and other leaders of the steel union revealing their demands at Pittsburgh last week.*

Pittsburgh

• • • **Phil Murray's** United Steel Workers of America laid down a post-war barrage here last week which left the steel industry fairly staggering. Aside from a demand for a 17c. an hour increase for all wage earners, the union struck out with an eye towards post-war conditions by proposing, among other things, a separation wage payment for closed plants, a weekly wage guarantee for the life of the new contract, the elimination of geographical wage differentials and a request for the retention of war-time wage victories involving such things as double time for the seventh day worked, time and a half for the sixth or seventh day even though the employee does not actually work previous days, etc.

The major program, which left some steel officials goggle-eyed, was approved last week by a wage and policy conference; and letters have already gone forth to contract holders, asking for a renegotiation of present contract. Lacking the machinery to deal with the steel industry on an industry-wide basis, the steel workers' union hopes to take on the 13 or 16 major steel companies concurrently. Mr. Murray hopes that negotiations may be under way by this coming Monday or Tuesday, Dec. 13 or 14. Steel producers were to have received letters of intention early this week.

When asked if he would like to deal with the industry as a group, rather than deal with individual companies, Mr. Murray stated "we are ready to do this at any time. The industry, however, apparently is not ready to do this at this time.

An analysis of the USWA's proposals is shown elsewhere in this story, and clearly indicates an attempt on the part of the union to not only obtain a wage increase to "offset rising living costs," but to retain, in contract form, all concessions gained during the war-time period. It seems obvious to labor observers that the list of demands made by the union represents what it would like to have, and not what it is likely to get. The granting of such concessions, in a single contract conference, would represent a gain that has taken many older and established unions a far greater number of years to even approach.

Unofficial conversations indicate that the industry, as a whole, will abruptly turn down the CIO demands, which will throw the entire problem into the lap of the WLB. The reasons for such anticipated procedure are not hard to find.

Obviously, the steel union demands would shatter the "Little Steel" formula to bits. In addition to the demand for a 17c. an hour increase, which would raise the basic rate from 78c. an hour to 95c. an hour, there are other proposals which will, likewise, add to the hourly rates. The WLB has scrutinized carefully all vehicles for raising the hourly pay of employees. Items included in the USWA's proposal, which would tend to raise the hourly rate in addition to the demand for a flat increase, are: A 5c. an hour differential for the afternoon shift (the one that begins at 3 or 4 p. m.), a 10c. an hour differential for the night shift (which begins at 11 p. m. or 12 midnight), elimination of geographical differences, an increase in the vacation pay, by changing the service requirements, a demand for revision in the present method for handling the sixth or seventh day's work, and the demand for a specified number of days for sick leave within a calendar year.

The union has gone strong on attempting to retain overtime features. Whereas under present contracts time and a half is paid for the sixth or seventh work day in the work week, providing the employee has worked the first five days of the work week, the union wants the same provisions for overtime even though under certain conditions the employee does not work some or all of the first five days. The same method which the union proposes is asked for in requesting double time on the seventh work day, after the present Presidential order for double time on a seventh consecutive day work is eliminated.

While no official figures on the probable cost of the CIO's grandiose proposal on an industry-wide basis are available, from either the union or steel companies, THE IRON AGE estimates that under present operating rates and employment the 17c. an hour boost, the slightly less than 5c. average per hour resulting from the shift differentials, the sick leave provisions, and the vacation cost, would cause the steel industry to make an additional wage outlay, on a yearly basis of from $260 million dollars to $280 million dollars. It is estimated that the 17c. increase alone, under present operating conditions, would, on an annual basis, increase payrolls of wage earners by more than $200 million dollars. The increased cost, due to shift differentials as proposed, would approximate $60 million dollars; and if the other con-

cessions were granted, they might approximate $20 million. This does not include probable white-collar increases.

Under present tax programs, however, increases in wage costs are about 75 per cent of the total, at the expense of Federal taxes, leaving, roughly, 25 per cent to be borne by the company before net earnings. On this rough basis, the cost of the CIO program to the steel industry directly, would probably amount to roughly $65 million to $75 million dollars a year on an annual basis, at current rates of operations.

• • • **Weekly** pay envelopes of the steel industry's wage earners in September, 1943, contained an average of $52.55 per employee—$18.60 more than average weekly take-home pay of $33.95 in January, 1941, according to the American Iron and Steel Institute. January, 1941, is the base month for earnings under the so-called "Little Steel" wage formula.

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Unions Expected to Demand 40 Hr. Week as Cancellations Reduce Volume

Washington

• • • **As contract cutbacks** involving perhaps as much as $3,000,000,000 for the War Department alone are apparently scheduled in the next few months, labor spokesmen report that the unions in mass production industries will make a concerted drive to return to the 40-hr. week as cancellations take place in volume.

This does not mean that labor unions are preparing to accept reduced wages. Quite the contrary, higher wage demands definitely will be made despite the prospect of shortened hours. Labor will make this demand to compensate for unemployment caused by heavy cutbacks.

The unions have said that they must have more money for workers because of the failure of the Administration to roll back prices. This failure is the reason that CIO, which will continue to strongly sue for higher wages in the steel industry, has sponsored and endorsed the food subsidy program on the ground that it is anti-inflationary.

Opponents of the subsidy program charge that it is an attempted Treasury raid to pay for labor's added food costs, and food processors increased production costs, at the expense of a great majority of the taxpayers.

On the surface labor's preparation for a stiff fight to return to a 40-hr. week seems a little premature and inconsistent in the light of the statement made by WPB Vice Chairman Charles E. Wilson on Dec. 1 and WMC's recent estimate of the number of workers which would be released because of contract cancellations in the next 90 days.

Mr. Wilson said that 1944 production would be 20 per cent higher than this year's. WMC said only 120,000 to 150,000 workers would be freed because of contract cutbacks.

But the War Department has not made public the fact that drastic slashes in ground ordnance of all kinds are contemplated. The 150,000 workers WMC reported may be dropped almost entirely by small ammunition makers. The number of employees to be freed who work for suppliers are not included in the estimate.

Actually, the overall cut will be 15 per cent in 1944 in ground ordnance, one high Administration official said. Some slashes in individual programs will be as severe as 80 per cent.

While for 1944, arms production has been projected at about $77,000,000,000, the 1943 last quarter rate was $62,000,000,000. This is thought by WPB to be the constant rate which will prevail throughout 1944, despite the fact that some programs will be accelerated while others will be retarded, or even wiped out.

What the Army does about placing cutbacks in less critical labor areas will control the degree of confusion caused by the lack of frankness on its part. WPB officials say that if the trend toward an easy manpower situation is not recognized by the Army with permission given to WPB to utilize the manpower for reconversion, the country will be packed with great pest areas of unemployment, while other areas will need manpower.

The factors which seem to be governing the Army's non-disclosure of the huge shifts in its programs seem to be: (1) Fear of complacency if civilian production is permitted to get under way; (2) Fear that organized labor will set up a squawk; and (3) Indifference and hostility toward devoting manpower, materials and machinery toward reconversion ends.

Although WMC recognizes that those discharged workers who are not trained to do other work cannot get jobs easily, and that labor distribution is spotty, the manpower agency sees an opportunity for almost every discharged worker to find new jobs in war industries.

WMC said that a demand for 500,000 new workers would have to be filled in the next five or six weeks.

The WMC reports that the areas in which labor shortages are either acute or expected to become acute within six months now total 193.

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U.S. Steel Heads Warn of Price Needs

• • • **Benjamin F. Fairless,** president of United States Steel Corp., commenting on the union notice of reopening existing labor contracts said:

"We believe in holding the line against inflation . . . but the corporation is certainly entitled to adequate protection against the financial consequences.

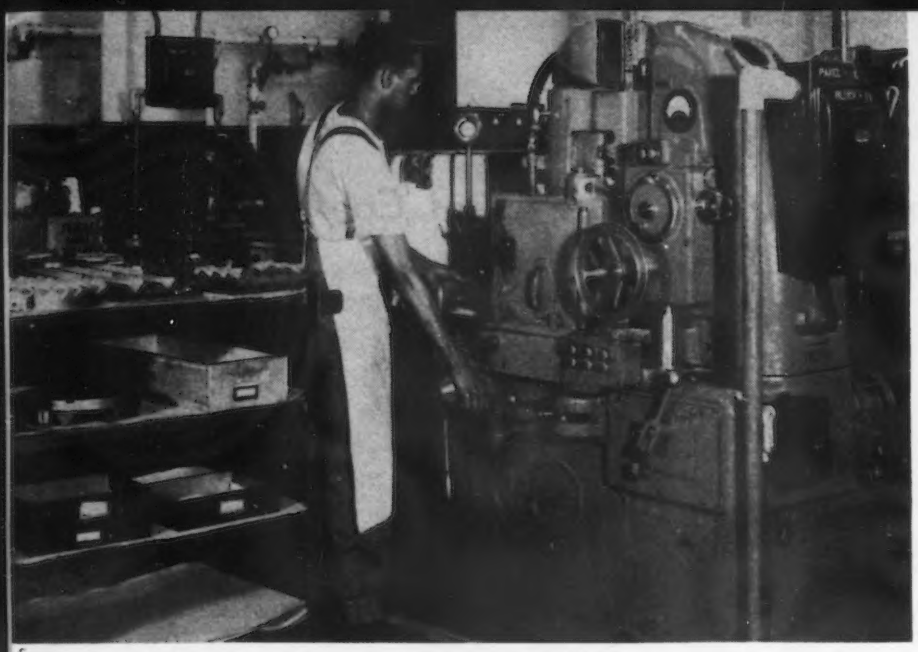
"If our employment costs are to be further increased as a result of wage and other demands by the USWA and the UMW, we have no recourse other than to seek a compensating increase in steel prices."

Enders M. Voorhees, chairman of the Finance Committee, United States Steel Corp., told the Finance Committee of the United States Senate last Saturday that "Even a small increase in wages would not only reduce the payments to owners or the amount carried forward for future needs, or both, but also would make operative the carry-back provision of Section 710-C of the Revenue Act of 1942. A substantial increase in wages would in effect put the tax mechanism in reverse and the Federal Government would pay back to U. S. Steel more than it collected from it. Thus the wisely enacted provision of Congress to offset in part postwar losses would become the means of paying wartime wage increases, and in the process U. S. Steel, although operating at capacity, would be squeezed dry and picked clean."

Proposed Steel Union Changes vs. Present Contract

Higher Pay for Afternoon and Evening Shifts, Separation Pay, Sick Leave and Numerous Other Provisions Demanded Now; Entire Grievance Machinery Overhauled.

New Proposals	Present Contract
BASE RATE—95c. an hr. (17c. an hr. boost for all employees).	78c. (Last boost in 1942 was 5½c. an hr.; 10c. an hr. granted in 1941.)
SHIFT DIFFERENTIAL—5c. an hr. on afternoon shift; 10c. an hr. on night shift. (Around 75 per cent of the steel industry is on swing shift.)	No provisions.
SEPARATION PAY—When plant or any portion is permanently closed down, employees with one to three years' service, four weeks' pay; three years or more, eight weeks' pay.	No provisions.
WAGE GUARANTEE—Weekly wage based on 40 hrs. at the average 1942 earnings per hr., plus new wage adjustments, to be guaranteed during life of contract. New employees: wage guarantee based on first three-month average.	No provisions. (All employees working one day are guaranteed a full day's pay, equal to the base labor rate or the fixed occupational rate. No weekly guarantee.)
GEOGRAPHICAL DIFFERENTIALS—All to be eliminated.	Mostly eliminated, except in South.
HOURS OF WORK—Time and one-half for sixth OR seventh day of regular established work week, even though employee, due to illness, no work, union duties, or reasons "beyond his control" does not work on some or all of the first five days of his regular week.	Time and one-half now paid for the sixth or seventh day IF employee works previous five days.
When Executive Order 9240 is eliminated, double time to be paid for work performed on the seventh day of the work week under the above conditions, i. e., even though some or all of the first five work week days are not worked, this provision would call for double time on the seventh day.	By Presidential order, double time is now paid for the seventh consecutive day which the employee WORKS.
Any hours of work compensated for on an overtime daily basis, to be included in determining overtime for over 40 hrs. a week.	No duplication allowed. If employee is paid overtime for one day, the overtime hours for that day are not counted toward determining overtime payment for over 40 hrs. in a week.
VACATIONS—One year, but less than three years, one week's pay; three years or more, two weeks' pay.	Three or more years, one week's pay; 15 or more years, two weeks' pay. (Some companies grant one week's vacation after five years' service.)
While industry is on 48 hr. work week, vacation pay to be based on 48 hrs. When normal work week is decreased, vacation pay to be not less than 40 hrs. per week.	Substantially the same.
Requirement that employee must receive earnings in at least 60 per cent of his pay periods to be eliminated.	Vacations granted only when employee has received earnings in at least 60 per cent of the pay periods in a year.
Employees in armed forces or Merchant Marine to receive vacation pay each year while in such service.	No such provision.
SENIORITY—In case of promotions and increase in forces, length of service is determining factor unless it is proved by TRIAL PERIOD that employee cannot do the work.	Continuous service determining factor only when ability to perform work and physical fitness are equal.
Decrease in forces, only length of service shall be determining factor.	Same as above.
Probationary period for new employees shall be 30 days.	Three months at U. S. Steel plants, six months at some other plants.
GRIEVANCES—Entire machinery overhauled. Main change speeds up time requirements on answers to grievances. Some answers must be made in 48 hrs.; others in five days.	No time limit on answers to complaints made to foreman. Three-day time limit on some other steps; 10 days on others.
SAFETY—Protective devices, etc., to be supplied by companies.	Reasonable provisions are to be made in accordance with practices prevailing at each separate plant; at the time contract was made.
RATE ESTABLISHMENT—No new rate because of new equipment, methods, etc., which result in a change in job duties, may be placed in effect unless mutually agreed upon, or as a result of an arbitrator's decision.	Company sets the rate and explains to grievance committee after rate is established. Trial period may be established. If disagreement, union may follow through by various grievance steps.
HOLIDAYS—Thanksgiving, New Year's, July 4th, Labor Day, Christmas and Memorial Day shall be holidays, and paid for at the rate of time and one-half. Holidays to be considered as day's work, whether worked or not, to determine consecutive days worked in a week.	These holidays are now given under Presidential order, but in current contract the following only are considered holidays: Fourth of July, Labor Day and Christmas. The new proposal is to carry through with war-time holidays.
MILITARY SERVICE—Maritime Service given same status as armed services.	No provision.
SICK LEAVE—Employees with one but less than three years' service entitled to seven days' sick leave with pay; 14 days for those with three years or more.	No provision.
CHECK-OFF—Maintenance of membership and check-off shall become part of the contract, which is to authorize the deduction of $1.00 a month or an amount not to exceed $1.50, in accordance yith the constitution of International Union.	This provision is part of the present contract only as a directive ordered by the War Labor Board. (The union seeks to make this a permanent feature.)
SALARIED EMPLOYEES—Provisions of this program with additional ones to be formulated at a white-collar conference, will be presented in separate collective bargaining conferences.	Wage earner's contract makes no provision for white-collared workers. Negotiations at Carnegie-Illinois, on a widespread basis, have been under way but have been deferred, pending outcome of proposals for wage earners.
TERMINATION DATE—New contracts will be sought for a period of two years, with provision for either party to open up contract on the issue of WAGES by furnishing a 30-day notice.	Continue in effect until changed or terminated, by 10 days' written notice to either party; and if no agreement within 30 days from said notice, the agreement shall terminate.



Lense grinding on Blanchard Machine at Frankford

Huge New Precision Optics Industry in U.S. Built with Aid of Machinery Industry

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By DONALD BROWNE
Washington Staff

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Washington

• • • **From infant to giant** in less than three years is the 1940-43 story of the optical industry in the United States.

In 1940 this country imported more than $6000,000 worth of optical glass, lenses and instruments, according to the Department of Commerce. Domestic production was valued at $10,000,000 to $15,000,000.

Today, the value of optical lenses and systems alone amount to more than $100,000,000 annually, and if instruments and military weapons and glasses are included the United States output is worth several hundreds of millions of dollars, according to War Department sources. The best peacetime optical year was 1929 when more than $40,000,000 worth was made.

The steel industry, the machine tool industry, the plastics and chemicals industries, all have profited by the fact that in this war as in the last, the United States was forced to produce its own lenses. In the last war, this country's output of optical munitions amounted to more than $65,000,000.

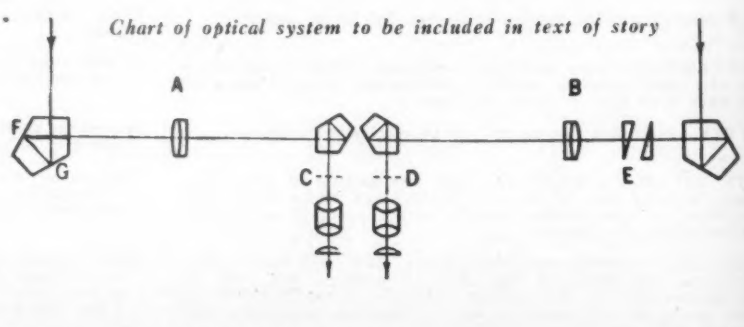
The task confronting the Government at the outbreak of war was to supply a vastly multiplied demand for all kinds of optical goods needed by the Army and Navy. The Ordnance Department had already taken steps to forestall national disaster by expanding its optical shop at Frankford Arsenal in Philadelphia and by helping the National Bureau of Standards to get funds for an optical glass producing plant which was later to supply 25 per cent of the nation's requirements.

Bausch & Lomb, Eastman Kodak, and the Spencer Optical Co. were asked to enlarge operations. The Frankford Arsenal sponsored more than five new companies which had never made lenses prior to the war to start their manufacture.

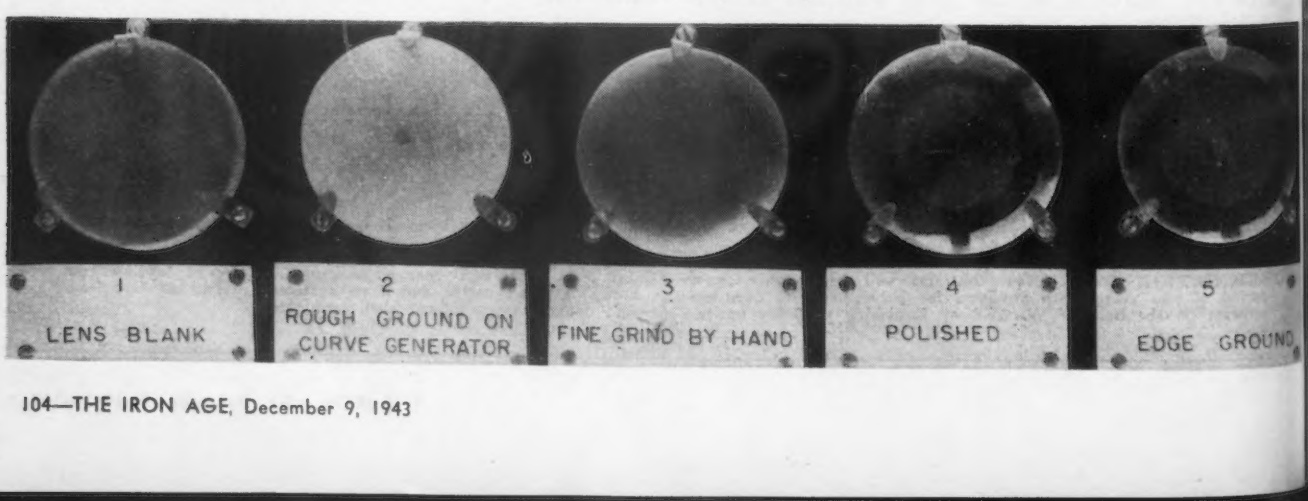
One huge obstacle was securing skilled technicians. This was done by intensified training of persons with aptitude, most of whom had never had any experience. Another was the development of new techniques and machinery to meet one of the most severe tests of American ingenuity.

At Frankford more than 1300 persons have been completely trained, many of them to work for private companies. Personnel destined for private companies were employed at minimum wages while learning, until progressing to higher skills. The Ordnance shop now employs 750 per-

Chart of optical system to be included in text of story



Lense from the raw to the finished product



sons, 72 per cent of whom are highly skilled.

The annual output of optical lenses and devices at Frankford is valued at $3,500,000. Glass coming into the works is valued at $125,000. More than 430 different types of optical elements are produced. Many private companies make no more than 10 different types.

Costs of production are comparative with private companies, Arsenal officers assert, although Frankford is a job shop which does not make its own glass.

Optical glasses vary in chemical composition, and this composition determines the use to which the glass is to be put. In general, optical glass is composed of fine white sand (silica), lime (calcium carbonate), potassium and sodium carbonate, and aluminum oxide.

In the receiving department, glass as it is shipped into the Arsenal is either in the form of slabs or pressed blanks. Small lenses and prisms are usually pressed, while larger lenses are made from slabs which are nearly the size of the lens in its final dimensions.

Inspection is performed in the receiving department. It is quite strict, but only 0.1 per cent of all glass is rejected for defects.

Across from the receiving department is the tool room. The great majority of these tools is cast iron grinding chucks, ranging in size from 2 in. to 12 in. The curvature of the chucks controls the curvature of the lenses when being ground.

The coarsest abrasive used in grinding at Frankford is 50 mesh or 297 micron (particle size). The finest abrasive is used just before polishing. Its particle size is 9½ microns, and it is finer than the finest face powder. Most abrasives are made from synthetic aluminum oxide.

When glass slabs are of irregular thickness or are too thick, it is necessary to cut off thin plates, or then grind the plates to correct thickness. Of these processes grinding is commonly adopted and consists essentially of grinding down by hand one side of each plate with coarse abrasives, on a rapidly rotating plane, cast iron disk, or spindle.

The rough grinding of lenses is accomplished by a "curve generator" which consists essentially of two Delta drill presses. The bottom one rotates the work and the upper one rotates the tool. **Employed before the war** as an opthalmic (spectacle lens) grinder, the curve generator mounts a diamond dust charged tool. An adjustable head, permits inclination according to steepness of the curve desired.

• • • Some companies may quit making precision optics after the war ends, but others will try to enter the ophthalmic end of the business, making spectacle lenses. The field may offer something of interest for machinery makers.

Both rough and fine grinding of prisms are done on the Blanchard grinder which has been adapted at Frankford for precision work on glass. For rough grinding, the prisms are held in a steel V-block fixture. For the necessary additional grinding and polishing, the prisms are placed in a plaster block. One machine and an operator now do work previously performed by eight men.

Prisms are arranged in a geometric pattern to prevent unequal cutting in a circular steel mold with approximately 12 in. diameter. A specially prepared plaster of Paris compound is poured over the prisms.

The "cake" or block of embedded prisms which have already been rough ground is mounted on the Blanchard, and a diamond sintered or resoid bonded silicon carbide grinding disc does the grinding.

In precision optics, the prisms must be of definite dimensions and angles must be correct within a plus or minus few seconds of arc. Penta prisms must be accurate to a plus or minus one second.

Consequently, the work on the Blanchard has to be precise. It grinds the surfaces of prisms, so that there are only 2/10,000 of an inch variation in plane parallelism in 12 in.

Standard "flat" and lenses, many of them furnished by the National Bureau of Standards, are used for testing purposes. The testing lens is brought in complete contract with the processed lens. The phenomenon of interferometric or Newton's fringes can be observed.

These fringes show up a brilliant orange and black when a monochromatic helium or sodium lamp is used as a light source. Three fringes are the tolerance, or 4/10,000,000 of an in. variation in the radius.

In the test for flatness, the arcs of the rings appear perfectly straight if the glass is flat. The tolerance in this case is 0.00000022 (22-100 millionth) of an inch of a perfect plane.

Disks or pressed circular blanks intended for lenses of relatively flat curvature are ground and polished in groups mounted on specially prepared tools. The tools have the desired radius of curvature and are rotated by spindles designed at Frankford. For each radius of curvature, one concave and one convex tool are used and in polishing the radii are commonly of the length desired for the lens surfaces.

In fine grinding, the curvature of the lens surface is tested from time to time with gages, and corrections for curvature are made by regulating the stroke of the grinding tool relative to that of the lens block.

To maintain the highest quality possible of optical instruments, an extremely high and rigorous standard is enforced at Frankford. This results in a rejection rate that, for the usual industrial shop, would be considered out of proportion. However, it should be thought of, Arsenal officers say, as a "selection" rate rather than a rejection rate.

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DPC Awards

• • • DPC contracts recently announced were:

Continental Distilling Corp., Philadelphia County, Pa., to provide plant facilities in Pennsylvania at a cost in excess of $2,000,000.

Lederle Laboratories, Inc., New York, to provide additional equipment at a plant in Rockland County, N. Y., at a cost in excess of $70,000, making a total commitment of more than $541,000.

Hamilton Engineering Co., Inc., Chicago, to provide equipment at a plant in St. Louis County, Mo., at a cost in excess of $120,000.

Lake City Malleable Co., Cleveland, to provide facilities in Ashtabula County, Ohio, in excess of $3,360,000.

Fort Pitt Malleable Iron Co., Pittsburgh, to provide equipment at a plant in Allegheny County, Pa., in excess of $415,000.

The War Department announced Dec. 1:

Authorization for construction at Laguna Madre Sub-Post of Harlingen Army Airfield, Texas, to cost $592,670. Work is to be supervised by the Galveston district office of the Corps of Engineers, and consists of additional housing, parking apron and extension of runways and taxiways.

Authorization for construction at Matagorda Peninsula Bombing Range, Texas, to cost $500,000. Work is to be supervised by the Galveston district office of the Corps of Engineers and consists of widening existing taxiways, additional runways and parking apron.

Better Stockpiles, Open Facilities Reflected by WPB Control Relaxation

New York

• • • **The War Production Board** is now planning to revoke such limitation orders as are seemingly no longer important to the prosecution of the war. This development, predicted in this magazine for several weeks, was made clear to staff members of WPB in Interpretation 2 to WPB General Operations Circular No. 149 last week. A summary of relaxations in controls over various production materials during the week follows:

Freer use of chromium in the manufacture of stainless steel is permitted under an amendment to Order M-21-a and Direction 3, issued Dec. 1. Direction 3 provides that no person shall use in any calendar month in the melting of stainless more chromium in prepared form than the sum of the following: (1) 12,000 lb.; (2) 7 lb. of stainless steel ingots and castings produced during that month; (3) 70 per cent of the contained chrome in low carbon stainless ingots and castings (carbon 0.10 per cent and under) produced during that month; (4) 60 per per cent of the contained chrome in high carbon stainless ingots and castings (carbon 0.10 per cent and under) produced during that month. The balance must be obtained from scrap and ore.

About 3,000,000 lb. of fabricated copper and copper base alloy parts were released for use in the making of builders' finished hardware, cabinet locks and padlocks, through an amended version of Schedule I of Order L-236.

The shortage of malleable iron caused WPB to amend Order L-193 which now permits the use of Hadfield manganese steel in conveyor chains and sprockets and mechanical power transmission chains and sprockets. Manganese steel is currently in a favorable position. At the same time the amendment prohibits the use of metal in bins, hoppers, tanks or bunkers of more than 400 cu. ft. except for clips, gussets, bolts and other fittings and reinforcement elements. For bins, hopper, etc., of less than 400 cu. ft. no steel plates of more than ¼-in. thickness may be used. No liner plates may be used in bins, tanks or hoppers.

A program calling for redistribution of 1,200,000 new brass and bronze valves having a value of $3,500,000 through normal trade channels was announced by WPB.

In another material relaxation last week WPB removed the requirement to secure authorization to cover deliveries of restricted bauxite to manufacturers of alumina or abrasives. The means of securing authorization to deliver restricted bauxite or alumina to other types of users was also eased, both actions appearing in amended Order M-1-h.

Direction 1 to CMP Reg. 5 issued last week now permits patternmakers to obtain up to 600 lb. more aluminum per quarter for patterns, bottom boards and flasks.

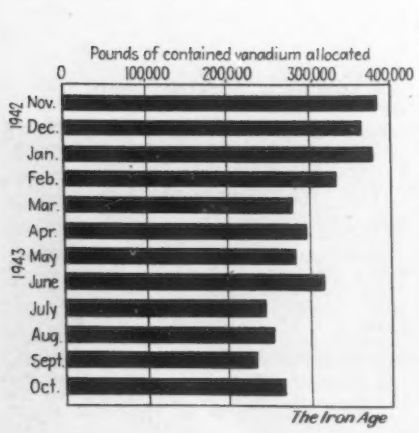
Aircraft contractors have been notified by ASU that they no longer need to notify of the purchase of other than aircraft materials and may transfer such materials without reporting.

Amendment 1 to Order M-9-c releases for unrestricted use copper insect screening refused by Copper Recovery Corp., in rolls cut before Apr. 9, 1943, and reusable screening.

Direction 1 to CMP Reg. 1 now permits brass mills to accept orders for copper water tubing without WPB approval.

WPB is unofficially reported to be considering lifting allocation control from many if not all grades of pig iron to be effective in the first quarter.

Consumption of Vanadium Lagging Behind Production; Control May Be Eased



• • • **Continued restrictions** on the use of vanadium would seem to be unnecessary, it was stated at a WPB industry advisory committee meeting Oct. 25. Production has been in excess of consumption since Jan. 1 and the stock-pile goal is nearly reached. Between November, 1942, and September, 1943, there was a drop in allocations of 40 per cent, largely due to the drop in high speed tool steel meltings, which in November, 1942, totaled 11,857 tons against 5,815 tons in August, 1943.

Allocations totaled 3,366,000 lb. during the 12 months, while consumption was 3,550,000 lb. First quarter of 1944 requirements are around 948,000 lb., and for second quarter are 941,000 lb.

Production for 1943 has been estimated at 5,700,000 lb. of contained vanadium. September production was 475,000 lb.

Stocks—The WPB asked the Metals Reserve Co. to purchase and stock-pile three million pounds of ferrovanadium, the committee was told. On Oct. 20 MRC reported that (1) it had contracted for 1,225,000 lb. of contained vanadium and (2) deliveries as of Oct. 15 totaled 1,153,386 lb. (2,562,776 lb. of ferrovanadium). Since the purchase of 305,000 lb. of contained vanadium in July and August, which WPB recommended, would have brought the stock-pile up to the goal of three million pounds of ferrovanadium and since the MRC reports show an undelivered balance of 437,224 lb., committee members were asked to check their records to see whether any deliveries are yet to be made.

The recommendation on vanadium (which has been presented for approval by the Production Executive Committee and the Requirements Committee of WPB) calls for a minimum stock of two million pounds of contained vanadium in products (ferrovanadium or vanadium pentoxide). Based on new consumption figures, the recommended stock is equivalent to a 6 months' supply.

Total stocks on Aug. 31 were 2,062,000 lb., of which the Government held 948,000 lb. and industry (producers and consumers) 1,114,000 lb. Stocks in consumers' hands during the past 6 months have averaged 415,000 lb.

Newly issued CMP Reg. 9A permits repair shops to obtain greatly increased quantities of carbon and alloy steel, copper and copper base alloys and aluminum.

New sugar processing machinery and parts and equipment can once again be produced through the removal of these items from schedule B of Order L-292.

Limited only by a 75 per cent of base period quota, X-ray equipment may once again be supplied to civilian medical practitioners. This was accomplished through a revision of Order L-206.

A relaxation of limitations is expected shortly which will permit the manufacture of about 64,000 apartment type electric cooking ranges.

WPB last Friday eased restrictions on the use of aluminum to permit its employment in the manufacture of buses, and also for the fabrication of collapsible tubes. These two new wartime uses of aluminum are made possible by the issuance of Supplementary Order M-1-i, as amended.

Casket manufacturers are permitted to use ½ lb. more steel than they have been using for joining hardware of caskets under Order L-64 as amended Dec. 3 by WPB.

Although directives that prohibit the use of brass in the manufacture of radiator valve bodies will not be withdrawn prior to Dec. 31, WPB announced last Friday that these directives may not be renewed when they expire on that date. Manufacturers of radiator supply valves may then be resumed within the limits of material available.

Proposed changes in Schedule VIII of Order L-42, now under consideration, would lift some of the restrictions on the manufacture of vapor and vacuum heating specialties, according to WPB's Plumbing and Heating Division.

Huff Replaces Kennedy As OPA Iron and Steel Price Head

Washington

• • • **The resignation** of Donald D. Kennedy as price executive of the Iron and Steel Branch of OPA and the appointment of Warren M. Huff, associate price executive, to succeed him as head of the branch, were announced last week by Clarence W. Slocum, director of the OPA Industrial Materials Manufacturing Price Division. Kennedy will become associated with Farrell-Cheek Mfg. Co. His resignation will be effective Dec. 20.

It was through Kennedy's and Huff's efforts that the Iron and Steel Branch's basic policy of full co-operation between the OPA and industry was continued.

The OPA release announcing the personnel changes said the Iron and Steel Branch during this period also took a lead in promoting adherence to its price schedules through industry co-operation and "the result was a stabilized iron and steel price structure." In the last wear, the OPA statement said, steel plates soared to $180 a ton, steel shapes went up to $123.80, steel wire rods skyrocketed to $96.25, and billets climbed to $95. In the present war, steel plates, shapes and wire rods each are selling at $42 per ton, and steel billets at $34, the same prices as prevailed before the war began. [Editor's Note: The high steel prices cited as prevailing during the last war evidently refer to levels prevailing before the United States entered hostilities. The War Industries Board fixed much lower prices, plates for example being fixed at $65 a ton.]

Allocations of Moly May Be Abolished

• • • **With production** exceeding demand and a comfortable stock-pile on hand, discontinuance of the allocation restrictions over molybdenum can be expected. This was indicated at a WPB industry advisory meeting Oct. 28. Order M-110 can be entirely rescinded or it can be amended to abolish allocations.

Lend-lease requirements are easier and Class A and B high speed steel production is lower sharply.

In the third quarter of 1942, allocations for lend-lease and Canada were 4,386,000 lb. compared with 3,445,000 lb. in third quarter of 1943. In first and second quarters of this year 4,147,000 and 3,777,000 lb., respectively, were allocated. Russia is getting 340,000 lb. monthly. The United Kingdom, normally getting about 2,000,000 lb. per quarter, has reduced its original request for fourth quarter by 1,500,000 lb.

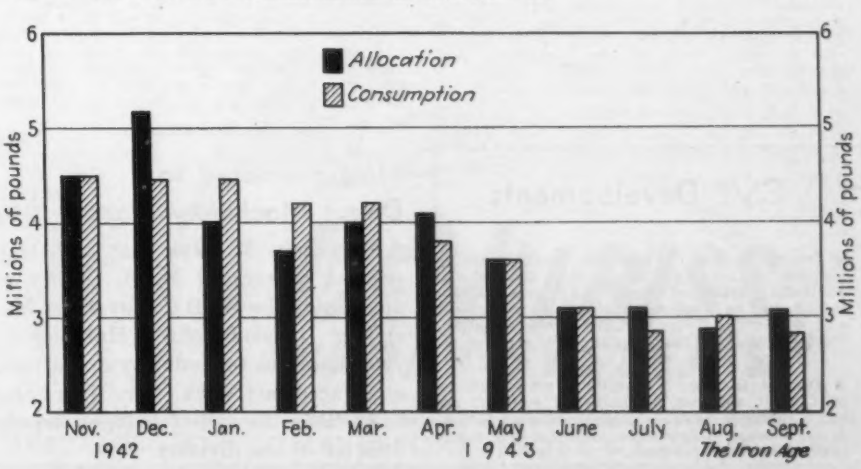
It is estimated that in the fourth quarter of 1943 a total of 11,212,000 lb. of virgin molybdenum will be needed to meet foreign and domestic requirements, not including a special Russian allocation of 1,350,000 lb. of contained moly in ferro.

Estimated 1944 requirements (in millions of pounds) for contained molybdenum in usable form are estimated as follows (based on continuation of low export rate as computed for fourth quarter of 1943):

1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
11,093,000	11,122,000	11,123,000	11,223,000	44,561,000

In the first 6 months of this year, molybdenum output in usable form totaled 31,200,000 lb., or 5,200,000 lb. monthly. These figures include domestic production (93 per cent) and imports (7 per cent). In July and August output amounted to 10,700,000 lb., or 5,300,000 lb. a month, representing a gain of about 2.7 per cent. The total production for the year 1943 on this basis has been estimated at 62,800,000 lb. The over-all use is anticipated at 52,400,000 lb. for the full year, or about 10,000,000 lb. less than the projected production figure.

As of Aug. 31, 1943, industry and Government-held stocks of molybdenum concentrates totaled 12,315,000 lb. In terms of products, both industry and Government-owned stocks amount to 11,476,000 lb. The total, for both concentrates and products, is 23,791,000 lb. On the basis of the present consumption rate, this figure represents a 6-month stock-pile of virgin molybdenum, which is proposed as the amount below which total stocks should not fall. The minimum stock-pile objective is stated in the recommendation as 24,000,000 lb.



Institute Sees 1943 Record Set for 6 Classes and Total Tonnage Shipped

• • • **New records for shipments** of at least six major classes of steel products, as well as a new peak for the total tonnage of steel shipped to consumers, seem destined to be set during 1943, it is indicated by reports, from the American Iron and Steel Institute covering shipments in the first ten months of the year.

Total shipments of all classes of steel products over that period of the year were 55,684,000 tons—more than 1,200,000 tons greater than shipments in the corresponding months of 1943.

The **products for which** new records are in the making include steel plates, hot-rolled and cold-finished bars, both carbon and alloy steel, and also seamless steel pipe and tubing.

In the first ten months of this year, steel plate shipments totaled 10,678,000 tons, exceeding the 1942 total by about 10 per cent. Hot-rolled carbon steel bar shipments in the first ten months totaled 5,935,000 tons, about 8 per cent above 1942. Shipments of 2,931,000 tons of alloy steel bars through October of this year indicate a year's total about 40 per cent above 1942.

Cold finished carbon bar shipments in the first ten months of 1943 totaled 1,473,000 tons which would indicate a year total up about 40 per cent; seamless pipe and tubes 1,825,000 tons, up by several thousand tons.

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Priorities Reg. 18 Clarified by WPB

Washington

• • • **Within-company deliveries** are not subject to the order-placing requirements established in Direction 1 to Priorities Regulation 18, it was announced last Friday by WPB in issuing Interpretation 1 to this direction. The interpretation points out that "intra-company" means that only one producer, as defined in Priorities Regulation 18, is involved in the transaction.

The interpretation also makes clear the following points with respect to Direction 1 to Priorities Regulation 18:

1. A producer must not accept an order for one of the products covered by the direction if he has purchase orders on hand that bear equal or higher priority ratings or that are part of a frozen schedule and because of such orders he does not believe he will be able to fill the new order.

2. Direction 1 specifies that if permission to place an order for one of the products covered has been obtained under another rule or regulation of WPB, permission to place a late order under the direction will not be required. Authorization to place purchase orders is valid for this purpose whether issued before or after the issuance of the direction.

3. The direction does not apply to: (1) orders for listed products required for MRO, (2) orders placed with or by persons who take physical delivery of listed products for resale, (3) orders for used or second-hand products, and (4) orders for specified products (Group B) in any case where all orders placed with the producer for delivery of the same item on the list to the customer in the same calendar quarter do not exceed $10,000. This provision permits producers to accept late purchase orders for such items upon the representation of the purchaser that it falls within one of the exemptions, unless he knows or has reason to know that the orders do not fall within the specified classifications.

4. The direction excepts orders that are placed by persons who take physical delivery of the products for resale. This means resale as such, rather than as components or parts of other equipment.

5. In determining the aggregate purchase price of items in Group B subject to the $10,000 exemption, persons should not include orders that are specifically authorized for late placement by WPB, orders that are placed before the deadline, or orders specifically exempted from the direction. However, in determining the $10,000 exemption all purchase orders for products within the same item must be included. For example, all purchase orders placed on a single producer for delivery in a single quarter of fluid power systems must be included no matter how many different models or types of fluid power equipment are involved. Orders for the same items placed on different producers, however, need not be included.

CMP Developments

• Dir. 1 to Reg. 5 provides that aluminum for the manufacture of bottom boards and additional types of flasks may now be obtained by pattern makers under procedures and within the limits outlined in the direction. (Release No. WPB-4631)

•

• Dir. 14 to Reg. 5 permits a manufacturer of asphalt shingles, asphalt roll roofing, asphalt siding, asbestos shingles, asbestos siding, or cork board to purchase nails for the application of these products.

Hale Promoted to Direct Machinery Branch

• • • **Henry M. Hale** has been appointed to succeed M. B. Garber as director of the WPB Construction Machinery Division, John J. Hall, deputy vice-chairman for industry operations, announced last week. Mr. Hale came to WPB in the fall of 1943, as deputy director of the division.

Priority Changes

L-64—Amended order permits casket manufacturers to use ½ lb. more steel than they have been using for joining hardware and to resume the use of wool for outside coverings of caskets. (12-3-43)

•

L-142—Sched. 3 eliminates metal jackets, plugs and compression cocks from production of low pressure heating boilers. (12-4-43)

•

L-193—Amended order permits the use of Hadfield manganese steel in conveyor chains and sprockets and mechanical power transmission chains and sprockets. (12-1-43)

•

L-197—Order keeps control over new locomotives, but restrictions covering used locomotives have been removed. (12-4-43)

•

L-197-a—Order consolidates control over new railroad and industrial cars. (12-4-43)

•

L-197-b—Order revoked. (12-4-43)

•

L-206—Amended order relaxes controls over the manufacture and distribution of X-ray equipment. (11-29-43)

•

L-236—Sched. I, as amended, releases approximately three million lb. of fabricated copper and copper base alloy parts for use in the manufacture of builders' finishing hardware, cabinet locks and padlocks by permitting the use of such fabricated parts as are held in inventory on Nov. 30. (11-30-43)

•

L-292—Sched. V eases slightly restrictions on production of sugar processing machinery. (11-30-43)

•

L-292—Int. 1 notifies manufacturers of food processing machinery that WPB will attempt to break bottlenecks on components. (12-4-43)

•

M-1-h—Amended order removes the requirement to secure authorization to cover delivery of restricted bauxite to manufacturers of alumina or abrasives, or to cover delivery of alumina to manufacturers of aluminum and abrasives. (12-2-43)

•

M-1-i—Amended order eases restrictions on the use of aluminum to permit its employment in the manufacture of buses, and also for the fabrication of collapsible tubes. (12-3-43)

•

M-9-c—Amdt. 1 releases for unrestricted use copper insect screening which Copper Recovery Corp. has refused to accept, copper insect screening in any roll which had been cut before April 9, 1942, and used or second-hand screening. (11-29-43)

•

M-21-a—Amended order permits freer use of chromium in the manufacture of stainless steel. (11-30-43)

•

M-112—Amended order releases antimony from allocation after Jan. 1, 1944. (12-3-43)

•

M-293—Table 6 provides for the scheduling of production orders accepted by manufacturers for general industrial equipment. (12-2-43)

•

M-293—Table II, as amended, is a new table of products subject to the order. (11-30-43)

•

M-293—Table 15 provides for the scheduling of oil processing machinery and equipment, designated as the type used in processing of animal, fish and vegetable oils, fats, greases or petroleum products. (12-1-43)

•

Int. 1 to Dir. 1 of Priority Reg. 18 makes no change in the order, but explains how it is to be applied in six different cases. (12-2-43)

4 Tons of Axis-Busters

RIDING FOR A FALL!

Scratch for cover, Japanazis! Many more of Uncle Sam's great Liberators are headed your way. And each one packs four tons of death-dealing bombs—bombs that seldom miss their targets!

★ ★ ★

The world-famous Liberators are not only giant planes, with wingspread of over 100 feet, not only far-flying planes, with range of over 3,000 miles . . . they're surprisingly fast, as well. And fast in the building, too! Today, at the Consolidated Vultee Aircraft Corporation, almost three Liberators roll off the assembly line for every one produced in April, 1942. *More than 4,500,000 man hours per year have been saved by the introduction of faster methods and labor-saving devices!*

The DeVilbiss Company is proud to have contributed to this outstanding accomplishment. Because DeVilbiss spray guns apply the war paint *faster*, each Liberator goes a'bombing *sooner*. Throughout Consolidated's great plants many types of DeVilbiss Spray Systems are saving precious time on countless operations.

If the things you make—whether they be war products now or peacetime products after "V" Day—require painting or finishing, let a DeVilbiss engineer show you how the correct DeVilbiss Spray System can do the job better in less time and at lower cost.

THE DEVILBISS COMPANY · TOLEDO 1, OHIO

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PROUD to have won the coveted Army-Navy "E" for excellence in war production, the men and women of DeVilbiss pledge to continue giving their all-out best—for Victory.

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Procurement Agencies Defend Termination

Washington

• • • **Undersecretaries** of War and Navy Robert P. Patterson and James V. Forrestal and Maritime Commission Chairman Emory S. Land, presented a united front in defending the executive agencies contract termination practices before a hostile Senate Finance Committee on Monday.

Discussions centered about the armed services objection to the provisions of the bill favorably reported by the House Military Affairs Committee providing for court review and the creation of a new board to which contractors might appeal.

The Undersecretaries were on the defensive and had to answer questions relating to charges that the negotiating agencies had been guilty of discrimination, duress and coercion, slowness of administrative action, and that there was little uniformity in the findings of the various price adjustment boards.

Senator Robert Taft, Republican of Ohio, keynoted what was apparently the entire Committee's attitude when he said:

"I want someone else to have the final say on renegotiation besides the Army and Navy."

Secretary Patterson said that he favored the review of renegotiated contracts and that he had no desire to be unfair or discriminatory. He said that at no time had the War Department opposed a court review. This sentiment was re-echoed by Undersecretary of the Navy Forrestal.

Francis M. Shea, Assistant Attorney General said that the right of appeal to the courts should be limited to those cases where a contractor can show clearly that the government negotiators have been "arbitrary and capricious" and that coercion had been imposed.

This drew the fire of Senator Taft who indignantly declared that if the Justice Department's recommendations were made law, only 1 per cent of renegotiated business could be reopened and that complaints on the basis of fact would have no merit.

A streak of light in the dark renegotiation picture became apparent when both of the Undersecretaries conceded that the day might not be too far distant when regotiation could be dispensed with.

Faced with accusations that the War Department had threatened to "break" the Budd Mfg. Co. and to withhold business from Warner-Swasey unless the companies submitted to the government's terms without so much as a wiggle, the armed services denied both charges.

Mr. Patterson sought to refute the charges of the Timken Detroit Axle Co. that had been made to the Committee about general unfairness of the Price Adjustment Boards.

Mr. Patterson said: "During the years of 1936 to 1939, the Timken Co. realized average yearly profits before federal taxes of 10½ per cent on its average net sales. In the year 1942 the profits on renegotiable business alone amounted to 33½ per cent. We find that Timken was making three times the rate of profit which it had made in the base year on 2½ times the volume of business.

"After renegotiation, Timken profits on its renegotiable business was $4,072,000. This represents 11 per cent on the adjusted net sales of approximately $37,000,000. That dollar profit is almost the average dollar profit earned by Timken in the base years. For that reason I approved the Board's decision."

Judge Patterson met the accusation of the Timken Co. that the percentage of profit allowed to it was less than that allowed to high-standard manufacturing companies.

Mr. Patterson revealed that $5,000,300,000 had been recaptured through renegotiation of which $1,000,500,000 would not have been received by the government under the excess profits tax. Mr. Patterson declared that all this money had been recovered at an administrative cost of a mere $5,000,000.

Geneva Structural Mill to be Halted

Washington

• • • **WPB is about to** formally recommend that construction of the structural mill at the Geneva (Utah) Works of the Columbia Steel Co. be suspended. It will be left to the Defense Plant Corp., which is financing the expansion program at Geneva, whether the project should be abandoned. The other units in the expanded program will be completed. They are now in an advanced state of construction. These include coke ovens, blast furnaces, open hearth furnaces and a plate mill. The plate mill is practically urgent because of heavy war requirements. But plates will not be rolled from it before late in February or in March.

Decision to abandon the structural mill was reached because it was not needed as part of war requirements in view of other structural capacity, such as at the Kaiser plant, this is included in the expanded steel rolling facilities. The Geneva structural plant is only in the early stages of construction but it is understood that equipment being built for the plant is about completed.

Price Briefs

• Amdt. 4 to RPS 29 makes an increase of 80c. per net ton in ceiling prices for by-product foundry and by-product blast furnace coke manufactured in the Central West. (Release No. OPA-3572)

•

• MPR 497 establishes a base ceiling price of 14½c. per lb. for antimony metal in a move to simplify price control in this field by translating existing "freeze date" ceiling prices into dollars and cents. (Release No. OPA-3561)

Civilian Production Scheduled to Start

Washington

• • • **Civilian production** is going to be started in the relatively free labor areas, despite the fact that such permission may cause unfair competitive advantages to be given some civilian producers.

At a meeting of WPB on Dec. 4 chairman Donald M. Nelson made the announcement. RFC chairman Jesse Jones agreed with Mr. Nelson as did majority of those present. Even War Manpower chairman Paul V. McNutt said he thought it was a good idea provided the manpower could be found.

Difficulties are expected by WPB officials who think that component and material shortage for civilian production may be an even greater retarding factor than the politics existant in the War and Navy Departments, which have hertofore been hostile to resumption of civilian production.

What part will machine tools play in helping to feed this hungry belly?

Here stands a souvenir of War—a silent, implacable challenge to the meaning of our words . . . Here stands *want.*

A grim reminder that we must not waste food now—that we dare not complain—it also says, as no words could, that part of the victory we're fighting for can only be won with plowshares.

What part will machine tools play? The greatest part in history. For there is scarcely an essential to civilized living today that does not stem from a handful of basic precision machine tools . . . from the barest necessity, a loaf of bread, to the most intricate and wonderful machines which help men think, to search and to know.

And one of these machine tools—the internal grinding machine—is essential to the creation of literally *everything* that will make this world a better place in which to live, after this war is won.

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U.S.A.

Latest Helpful List Of Patents Held By U. S. Government

• • • **Below** is another installment of seized patents pertaining to the metalworking industry. These patents have been taken over by the U. S. Government and are available to firms which obtain a license from the Alien Property Custodian. Starting with the issue of Nov. 4 (page 95) THE IRON AGE has been publishing lists of the confiscated patents each week, with full information about their usage and possibilities. In the issue of July 8 in the news section, lists of seized patent applications were published.

The seized patents are grouped in classes. In the lists below, the subclass number is given first in parentheses, followed by the patent number, description of the patent, the inventor's name and his nation, and the date the patent was issued.

Class 266—Metallurgical Apparatus

(2) 1,674,431. Method of and apparatus for annealing metal wherein the heated metal, such as wire, is cooled within an atmosphere of a protective gas. F. Gieseche, Germany. 6-19-28.

(3) 1,981,411. Annealing and pickling plant for treating metallic strip material. A. Fritz, Germany. 11-20-34.

(3) 2,185,655. Furnace for the continuous annealing of bands, sheets, and wires. E. Vits, Germany. 1-2-40.

(3) 2,206,734. Continuous heat treating furnace of the vertical type. T. Stassinet, Germany. 7-2-40.

(4) 1,711,633. Apparatus for hardening the runners of ice skates. H. Dornseif, Germany. 5-7-29.

(4) 1,879,850. Apparatus for surface hardening of the inner wall of hollow bodies. F. Klopp, Germany. 1-3-33.

(5) 1,662,516. Machine for tempering saw blades, plane knives, and similar tools. P. Hustadt and K. Hustadt, Germany. 3-13-28.

(5) 2,132,110. Apparatus for surface hardening metal articles which permits the velocity of the burner to be adjusted to suit a particular article. H. Holler, Germany. 10-4-38.

(5) 2,151,971. Apparatus for surface hardening the teeth of double helical gears. H. Holler, Germany. 3-28-39.

(5) 2,199,313. Apparatus for surface hardening toothed wheels, wherein the burner is automatically moved with the aid of a cam plate and a magnet wheel. H. Holler and W. Flasskamp, Germany. 4-30-40.

(6) 1,745,023. Clamping device for use in hardening the heads of railway rails which is characterized by a clamping support combined with a crane and tongs mechanism coacting with the said support. J. Lukasczyk, Germany. 1-28-30.

(6) 1,752,646. Apparatus for strengthening the heads of railway rails. J. Lukasczyk, Germany. 4-1-30.

(6) 1,816,377. Machine for bending and tempering leaf-springs. P. Hobracht, Germany. 7-28-31.

(6) 1,858,860. Apparatus for the manufacture of rails with hardened heads. H. Kurz, Germany. 5-17-32.

(6) 1,948,480. Automatic machine for hardening gears. H. Schicht, Germany. 2-20-34.

(6) 2,166,731. Method of and apparatus for hardening gears. H. Schicht, Germany. 7-18-39.

(7) 2,114,782. Apparatus for treating metal sheets in liquids. E. Kohler, Germany. 4-19-38.

(7) 2,163,276. Apparatus for cleaning metallic articles comprising a perforated cylindrical tumbling basket, a tank and inclined rollers journalled adjacent to the tank edge

You Can't Build the Future on a Flaw!

SMOTHER THE BUMS!

Right now most copies of "Science in Springs" are being used to develop war products. The manual is filled with helpful engineering data on the design and manufacture of springs—information that can be most helpful in planning your own products. Your signature on the letterhead of your company will bring the book to you—at no cost.

THOSE PRODUCTS of yours which are being planned now to compete in a competitive future era are being planned with great care. But one flaw in the design or construction of any part of that product . . . and your plan can fail. Consider, for example, one of the smallest parts of any machine . . . a spring. You depend on that spring to do its job, yet, some people are willing to call any piece of coiled wire a spring. There's one flaw right there—a flaw that Hunter stands ready to correct. With Hunter and other good springmakers, the design and construction of a spring to do the job calls for an engineer's mind and experience, for knowledge of mathematics, chemistry, metallurgy, research, testing and inspection. It may involve the conception of new research instruments, or a detailed report like the one which Hunter prepared to cover the design and performance of a mechanism and a spring, the spring weighing only .000053 lb. These are some of the reasons why your springs, at least, *will* perform—if Hunter designs or makes them . . . why they won't let you down.

FORCE DEFLECTION CHARACTERISTICS OF 3 BASIC TYPES OF SPRINGS *In designing springs (in this case an extension, a compression, and a torsion spring) Hunter has long recommended the drawing of a pressure diagram in order to record the specifications graphically, and to reveal simple errors which may represent serious faults in performance. The force deflection characteristics of these three springs are represented by the plexiglass curves. Note that in the case of the torsion spring, a polar diagram is represented instead of the usual linear diagram commonly employed. Construction and use of these diagrams are explained in detail in the Hunter Data Book.*

HUNTER

Science in Springs

HUNTER PRESSED STEEL COMPANY, LANSDALE, PENNA.

and spaced substantialy in parallel to one another and extending a suitable distance into the liquid. R. Fritzsche and A. Bauer, Germany. 6-20-39.

(7) **2,168,205.** Machine for receiving and conveying into and out of the pickling tanks, piles of sheet billets, semi-finished rolled products, sheets, and other material to be pickled. K. Harten and A. Lerg, Germany. 8-1-39.

(9) **2,161,181.** Melting furnaces for iron, steel and the like of the type adapted to be fired with powdered fuel. P. Marx, Germany. 6-6-39.

(9) **2,223,569.** Process and apparatus for the direct recovery of heavy metals of the nonferrous group from ores and other primary materials. J. Lohse, Germany. 12-3-40.

(11) **2,161,180.** Apparatus for continuously melting metal in a fuel-fired cupola which is adapted to produce low carbon iron. P. Marx, Germany. 6-6-39.

(15) **2,181,232.** Device for use in connection with the outlet openings of chimneys, flues and the like connected to converts, cupolas, or the like. J. Haag, Germany. 11-28-39.

(18) **1,985,171.** Distillation of metals from their ores or the like. F. Johannsen, Germany. 12-18-34.

(18) **2,007,332.** Apparatus for the distillation of zinc and other volatile metals. F. Johannsen, Germany. 7-9-35.

(18) **2,013,486.** Rotary furnaces having a number of muffles for carrying out endothermic processes, etc. G. Brunkow, Germany. 9-3-35.

(18) **2,017,401.** Apparatus for the distillation of readily volatilizable metals, such, for example, as zinc or cadmium. F. Johannsen, Germany. 10-15-35.

(18) **2,021,365.** Apparatus for the fractional condensation of metal vapors in a condenser rotating about a horizontal axis. A. Leysner, Germany. 11-19-35.

(18) **2,208,418.** Apparatus for the smelting out of zinc from dusts containing metallic zinc. O. Goeke, Germany. 7-16-40.

(18) **2,315,123.** Apparatus for carrying out a continuous metallurgical process for the dressing of raw materials in a flame chamber. J. Lohse, Germany. 3-30-43.

(19) **1,966,627.** Distillation apparatus for the production of zinc or similar volatilizable metals. F. Johannsen and A. Leysner, Germany. 7-17-34.

(21) **1,877,608.** Apparatus for sintering roasted materials comprising a furnace, a furnace chamber with a removable bottom constructed in one or more parts on which the solid combustible material and afterwards the charge to be sintered is placed. G. Stein, Germany. 9-13-32.

(21) **2,166,880.** Springing arrangement for automobiles with independent wheels, using rubber members stressed in shear and adhering between two plates. H. Schuh and W. Boxan, Germany. 7-18-39.

(23) **1,773,664.** Transportable guiding device for cutting burners. W. Eberle, Germany. 8-19-30.

(23) **1,748,870.** Machine for guiding cutting burners. W. Eberle, Germany. 2-25-30.

(23) **1,801,916.** Apparatus for the autogenous cutting of holes in metal. H. Greggersen, Germany. 4-21-31.

(23) **1,825,606.** Blowpipe cutting and welding machine. A. Schmidt, Austria. 9-29-31.

(23) **1,901,254.** Power driven oxygen jet cutting apparatus for cutting metal and means for controlling the movements of such apparatus. A. Messer, Germany. 3-14-33.

(23) **1,921,887.** Device for guiding implements, particularly the burner of cutting burner or welding machines. A. Schmidt, Austria. 8-8-33.

(23) **1,921,888.** Machine for guiding cutting or welding burners, electrodes, and like implements. A. Schmidt, Austria. 8-8-33.

(23) **1,932,641.** Self fed autogenous fusing machine wherein the driving axle arranged in the front portion of the autogenous fusing machine is oscillatable independently of the gun-carriage like frame. A. Scheidhauer, Germany. 10-31-33.

(23) **1,974,513.** Automatic feed welding and fusion cutting machine. A. Scheidhauer, Germany. 9-25-34.

(23) **2,017,475.** Machine for the guidance of tools, and more particularly of fusing burners. A. Schmidt, Austria. 10-15-35.

(23) **2,035,765.** Autogenous welding and cutting machine for working on tubes where-

LATROBE

High Carbon • High Chrome
DIE STEELS

COBALT CHROME
AIR HARDENING

GSN SPECIAL
AIR HARDENING

GSN
OIL HARDENING

FOR MAXIMUM PRODUCTION RUNS

TYPICAL ANALYSIS

	C	Si	Mn	Cr	V	Mo	Co
GSN Oil Hardening	2.20	.50	.50	13.20	—	—	—
GSN SPECIAL Air Hardening	1.50	.30	.30	11.50	.30	.70	—
COBALT CHROME Air Hardening	1.35	.50	.25	12.50	—	.70	3.00

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One of our service engineers can help you determine which of these essential Latrobe Steels will best meet your requirement, thus assuring you of *maximum production runs!*

TOOL STEELS FOR VICTORY

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in the burner is controlled in its movement by the rolling of a driving wheel against the outer surface of a cylindrical body. A. Schmidt, Austria. 3-31-36.

(23) 2,058,672. Portable blowtorch apparatus of the type in which the torch is carried by a casing movable over the work and in which it is desirable to mount the torch as closely as possible to the casing wall. W. Eberle, Germany. 10-27-36.

(23) 2,185,781. Apparatus for effecting the automatic advance of autogenous cutting torches adapted to be actuated by the oxygen used for the cutting operation. E. Becker, Germany. 1-2-40.

(23) 2,207,787. Hand steered metal cutting apparatus of the type in which a drawing or the like is traced to determine the path of a blow torch over the work piece, and in which the controlled movement of a motor driven traction wheel, traveling on a substantially plane surface, is transmitted to said blow torch. W. Eberle, Germany. 7-16-40.

(23) 2,249,413. Torch cutting apparatus including a torch, a gage adjacent to the tip of said torch and adapted to ride over a work surface. R. Bechtle and E. Habermehl, Germany. 7-15-41.

(23) 2,269,643. Cutting machine of the cross-carriage type provided with a separate and separately regulated drive for each carriage. R. Bechtle and E. Habermehl, Germany. 1-13-42.

(25) 2,211,127. Furnace bottom wherein the bottom is made with refractory blocks whose inner and outer faces are upwardly and inwardly inclined, with the inner face of each block overlapping the outer face of the block next inwardly thereof. F. Keydel, Germany. 8-13-40.

(30) 1,668,133. Cupola furnace with two or more superimposed rows of air nozzles. O. Weichel and W. Hollinderbaumer, Germany. 5-1-28.

(30) 1,830,683. Method of blowing blast into shaft furnaces. A. Wagner and E. Pohl, Germany. 11-3-31.

(31) 1,742,733. Device for retaining the flue dust in blast furnaces. J. Stoecker, Germany. 1-7-30.

(31) 1,941,545. Process for reducing the dust losses from shaft furnaces. G. Eichenberg and N. Wark, Germany. 1-2-34.

(32) 2,006,266. Process for cooling furnaces by means of cooling chambers. G. Dorrenhaus and S. Walter, Germany. 6-25-35.

(33) 1,647,608. Smelting furnace arrangement which is intended more particularly for the production of iron and steel. F. Corsalli, Germany. 11-1-27.

(34) 1,863,686. Device for the refining, mixing, and purifying of molten metals and metal alloys. F. Corsalli, Germany. 6-21-32.

(34) 2,182,064. Apparatus for treating hot molten materials with a gas at low pressure. A. Vogt, Germany. 12-5-39.

(36) 1,954,945. Spring structure especially adapted for use in motor vehicles and adapted to reduce liability of jars, shocks and the like to a minimum. H. Oltersdorf, Germany. 4-17-34.

(36) 2,229,383. Apparatus for the direct recovery from ores of heavy metals of the nonferrous group. J. Lohse, Germany. 1-21-41.

(36) 2,238,815. Apparatus for the direct recovery from ores of heavy metals of the nonferrous group. J. Lohse, Germany. 4-15-41.

(38) 1,717,813. Melting furnace and especially cupola furnace, in front of which is arranged a front hearth or receiver intended to receive the molten metal and removed some distance from the furnace shaft. W. Steffe, Germany. 6-18-29.

(38) 2,193,034. Apparatus for treating fluid materials under sub-atmospheric pressure. G. Mars, Hungary. 3-12-40.

(40) 1,681,043. Cupola with forehearth. H. Luyken, Germany. 8-14-28.

(41) 1,866,764. Interchangeable tuyère for cupola furnaces. R. Gerisch, Germany. 7-12-32.

(41) 1,994,115. Tuyère for shaft furnaces in which the opening of the nozzle is displaced relative to the longitudinal axis and the direction of the blast can be varied owing to the fact that the nozzle is rotatable about its axis. J. Stoecker, Germany. 3-12-35.

(42) 1,841,338. Apparatus for moving tamping machines to and from the operative position in the furnace tap hole. E. Schiegries and P. Ischebeck, Germany. 1-12-32.

(42) 1,849,995. Tamping machine wherein there is a closing valve situated between the advanced position of the plunger and the mouth-piece of the machine. E. Schiegries, Germany. 3-15-32.

(43) 1,704,902. Method of making the hearths, heating rings, or the like in metal-

What will users want in POSTWAR Machine Tools?

1. VERSATILITY will be a primary requirement of many machine tools sold in the postwar period . . . but versatility achieved without sacrificing high production rates and low production costs. Following every war, old products become obsolete and new products are developed with startling speed. Manufacturers must have machines which can be quickly and easily adapted to new purposes.

Exceptional versatility is characteristic of many machines equipped with Vickers Hydromotive Controls. The hydraulic method of control and power application is inherently the most flexible. There are more than 5,000 Standardized Vickers Units that can be combined to exactly supply every hydraulic power and control function:

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(2) any traverse rate
(3) any rpm
(4) any sequence of motions
(5) any acceleration or deceleration
(6) any thrust

Vickers Application Engineers will be glad to discuss how the versatility and the many other advantages of Vickers Hydromotive Controls can be applied to your machines.

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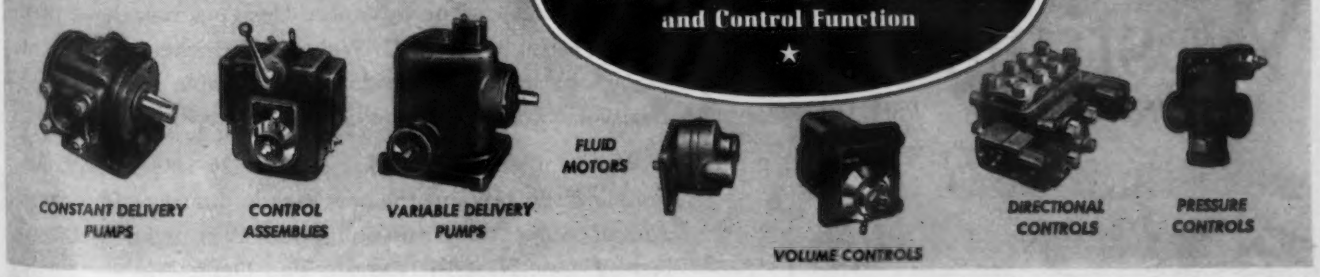

fabricates freight cars faster

...BECAUSE WESTINGHOUSE PRE-SET ARC CONTROL

converts wasted time into welding time

ONE SIMPLE ADJUSTMENT gives exact welding current desired. No exciter, rheostats or reactors to fiddle with.

ARCONTROL gives choice of three types of arc.

NO "DROOP" in welding current when machine warms up. Just pre-set—and weld!

BUILT TO "TAKE IT"! Banging can't damage the heavy, one-piece seamless steel frame. No tin boxes—all vital parts are *inside*.

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PLANTS IN 25 CITIES... OFFICES EVERYWHERE

FLEXARC WELDERS

The Greenville Steel Car Co., a prominent manufacturer of freight cars, uses every possible short cut to get cars on the rails faster. So, of course, they fabricate by arc welding.

More specifically, they use Westinghouse D-C Welders. Here are their buying reasons—which will be helpful to you in the selection of your welding equipment:

Reason one, is proved low maintenance—excellent service from their Westinghouse welding distributor on electrodes and accessories. Reason two, is preference for Flexarc D-C Welders by men in the shop—men who want no complicated welding controls to waste their time. Reason three, is the advanced design advantages of the new Westinghouse D-C Welder. No other welding machine on the market today is so simple to operate; so flexible in its applications; so efficient in operation.

Write for full details. Ask for DD-26-100. This 12-page booklet fully explains the new Westinghouse welder design. And of course, there's no obligation. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N. J-90476

lurgical and other furnaces. W. Rohn, Germany. 3-12-29.

(43) 1,825,011. Process for the production and repair of refractory linings for the hearths of metallurgical and other furnaces. H. Navratiel, of Flint, Michigan, Assignor to Vaccumschmeize G. M. B. H., of Germany, a corporation of Germany.

(43) 2,206,277. Refractory material for use in basic process siderothermic furnaces. G. Crespi, Italy. 7-2-40.

(43) 2,231,498. Method of building up refractory masonry, especially basic bricks, with spacing pieces of metal inserted in the joints between the bricks, such as brickwork linings of revolving cylindrical kiln or rotary furnaces. W. Geistler, Germany. 2-11-41.

(1) 2,305,823. Vessel for treating materials in the chemical and metallurgical industry. J. Wotschke, Germany. 12-22-42.

(4) 2,095,946. Apparatus for tempering rails. M. Blage, France. 10-12-37.

(4) 2,297,447. Apparatus for heat treating metallic goods in baths. C. Albrecht, Germany. 9-29-42.

(5) 2,109,711. Gas case-hardening furnace. L. Saives, France. 3-1-38.

(6) 2,143,753. Device for handling metal section members, and more particularly rails, in order to harden them. M. Blage, France. 1-10-39.

(6) 2,305,811. Apparatus for the heat treatment or thermal refinement of light metal work pieces. O. Oeckl, Germany. 12-22-42.

(17) 2,255,844. Metallurgical furnace for extracting volatile metals, e.g., aluminum and magnesium, out of materials, such as ores, containing the same. H. Gentil, France. 9-16-41.

(19) 1,715,960. Condenser for zinc vapors from electric furnaces. F. Tharaldsen, Norway. 6-4-29.

(20) 1,857,725. Furnace for roasting sulphide ores in order to convert them into magnetic compounds which subsequently may be separated from the still nonmagnetic valuable constituents of the material in a magnetic separator. H. Lassen, Norway. 5-10-32.

(20) 2,202,444. Roasting furnace particularly adapted for the thermal treatment of sulphurous ores such as blende and pyrite. E. De Rey, Belgium. 5-28-40.

(21) 1,774,135. Continuous apparatus working with drawn or blown blast or gas. A. Fassotte, Belgium. 8-26-30.

(21) 1,784,658. Apparatus for agglomerating and roasting minerals comprising a receptacle having a grate which receives a charge of the material to be treated and having a suction device, and in which fine and pulverulent combustible material may or may not be utilized as the source of heating according to the nature of the material to be treated. A. de Samsonow, Belgium. 12-9-30.

(21) 1,841,013. Device for roasting and agglomerating ores wherein the materials to be treated are poured at a certain distance in front of the melting zone and the treated materials are removed at a certain distance behind the said zone, the combustion being produced by a supply of air obtained through the materials situated on the movable bed plate. A. Dawans, Belgium. 1-12-32.

(21) 2,193,698. Draft sintering apparatus which is particularly adapted for the sintering of cement as well as for the sintering of other granulated material such as ores or the like. O. Rolfsen, Norway. 3-12-40.

(25) 1,668,550. Hooping of the stacks of blast furnaces. A. Cousin, Belgium. 5-8-28.

(25) 2,201,738. Process for carrying out reducing metallurgical reactions by the combustion of carbon in a shaft furnace. P. Neve, Belgium. 5-21-40.

(28) 1,693,916. Apparatus for the manufacture of pig iron. G. De Bethune, Belgium. 12-4-28.

(29) 2,113,619. Furnace for the agglomeration of pulverulent materials. E. Saint-Jacques, France. 4-12-38.

(29) 2,120,785. Furnace capable of being used for any roasting or calcination operations upon pulverulent materials and in particular for oxidation, reduction or other treatments of ores in the pulverulent state. E. Saint-Jacques, France. 6-14-38.

(30) 1,640,251. Cupola furnace consisting of a special arrangement and combination of sets of tuyères for the air blast. A. Poumay, Belgium. 8-23-27.

(30) 1,996,161. Automatic or semi-automatic regulating device for the management of furnaces and hearths of any nature, fed with solid, liquid or gaseous fuels. W. Loth, France. 4-2-35.

(34) 1,681,191. Apparatus for the refining of metals wherein the metal to be refined is subjected to the action of centrifugal force and at the same time to a heating which allows of bringing it to a sufficient degree of fluidity. J. Maximoff, M. de Costa, and R. Krebs, France. 8-21-28.

(34) 2,246,133. Apparatus for rapidly effecting metallurgical operations between molten metal and a reacting substance. A. Greffe, France. 6-17-41.

(36) 1,745,561. Converter for the direct manufacture of steel or iron by treating pig iron of cast iron therein in the presence of metallurgical carbon. G. Merturi, France. 1-14-30.

(This feature to be continued in an early issue.)

o o o

Recent DPC Contract Approvals

Washington

• • • **Defense Plant Corp.,** RFC subsidiary, has authorized the following contracts:

Goodyear Aircraft Corp., Akron, Ohio, to provide additional facilities at a plant in Summit County, Ohio, at a cost in excess of $620,000, making a total commitment of more than $9,100,000.

Brewster Aeronautical Corp., Long Island, N. Y., to provide additional equipment at a plant in Queens County, N. Y., at a cost in excess of $50,000, making a total commitment of more than $675,000.

American Machinery Corp., Orlando, Fla., to provide equipment at a plant in Orange County, Fla., at a cost in excess of $30,000.

General Motors Corp., Detroit, to provide additional facilities at plants in Union and Essex Counties, N. J., at a cost in excess of $300,000, making a total commitment of more than $8,450,000.

Colorado Fuel & Iron Corp., Denver, to provide additional facilities at a plant in Pueblo County, Colo., at a cost in excess of $110,000, making a total commitment of more than $5,630,000.

American Cyanamid & Chemical Corp., New York, to provide additional facilities at a plant in Tarrant County, Tex., at a cost in excess of $1,000,000, making a total commitment of more than $3,600,000.

Albion Malleable Iron Co., Albion, Mich., to provide plant facilities in Calhoun County, Mich., at a cost in excess of $1,500,000.

Waterbury Clock Co., Waterbury, Conn., to provide equipment at plants in New Haven and Fairfield Counties, Conn., at a cost in excess of $115,000.

Reed Roller Bit Co., Houston, Tex., to provide equipment at a plant in Harris County, Tex., at a cost in excess of $40,000.

Boeckeler Associates, Trenton, Mich., to provide plant facilities in Wayne County, Mich., at a cost in excess of $315,000.

Jensen Machinery Co., Inc., Bloomfield, N. J., to provide additional equipment at a plant in Essex County, N. J., at a cost in excess of $40,000, making a total commitment of more than $230,000.

American Bantam Car Co., Butler, Pa., to provide additional equipment at a plant in Butler County, Pa., at a cost in excess of $30,000, making a total commitment of more than $80,000.

Park & Tilford Distillers, Inc., New York, to provide facilities at a plant in Baltimore County, Md., at a cost in excess of $20,000.

Budd Asks Congress To Halt Renegotiation

Philadelphia

• • • **Edward G. Budd,** president of the Edward G. Budd Mfg. Co. and Budd Wheel Co. asked Congress last week, through a signed statement placed on every Congressman's desk, that war contract renegotiation be eliminated. Stating that while he thought the intent of the law, to prevent profiteering, is commendable, the machinery of renegotiation is so complicated that fairness is impossible.

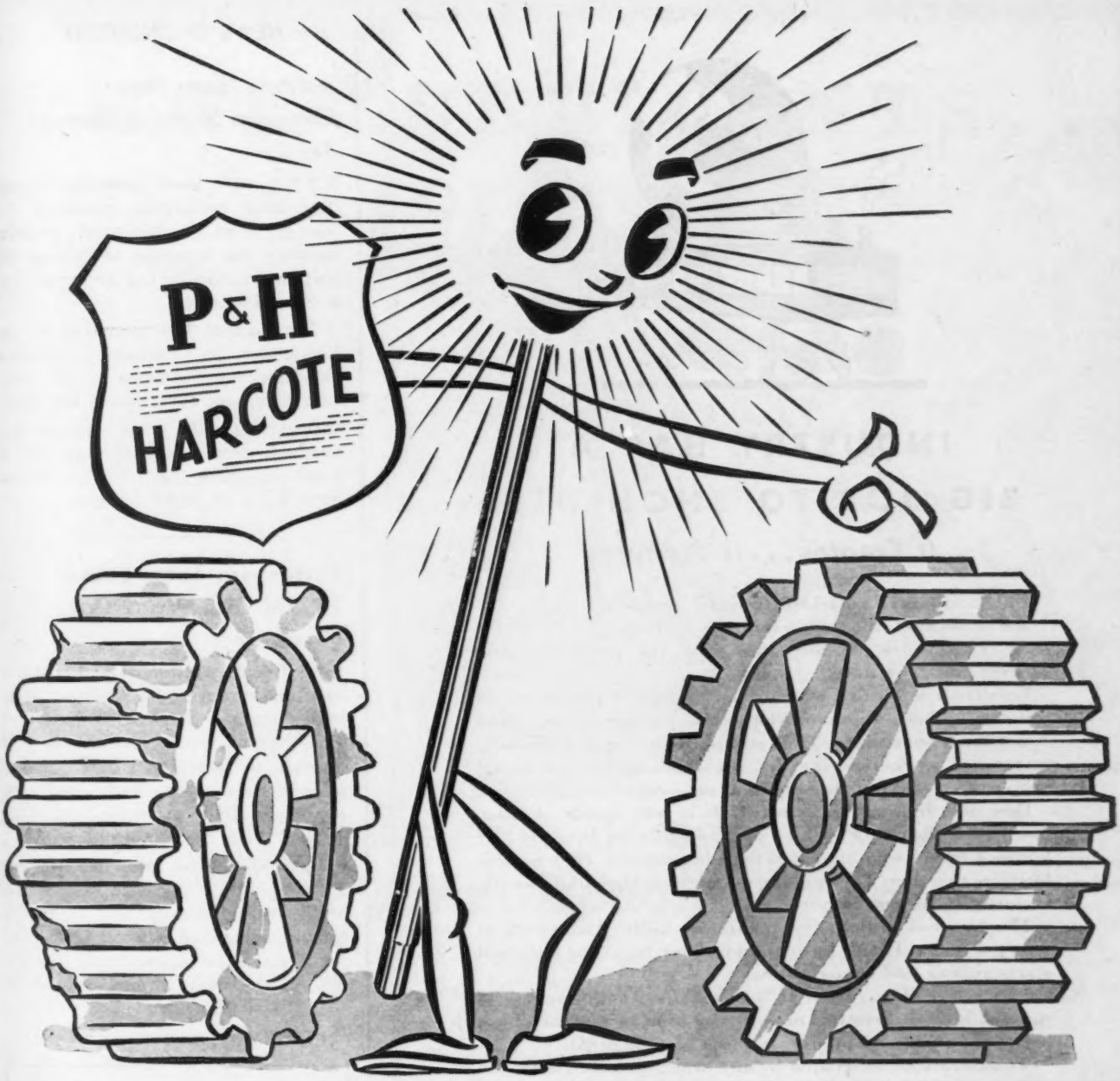
In his statement Mr. Budd continued: The Budd Wheel Co. has been engaged in making war munitions since the beginning of the war. The company initiated low-cost production methods that have saved the government many millions. Its patents have been given royalty-free for war use. It voluntarily reduced prices on shells to save the government more than $4,000,000.

In 1942 the Budd Wheel Co.'s sales amounted to $47,853,612, and its profit, after a minimum reserve and payment of taxes, amounted to $1,752,269, which was 3.7 per cent of sales. From this profit, the Price Adjustment Board in renegotiation, exacted a refund which left to the company after reserve only $142,269, less than four-tenths of 1 per cent on the value of work produced.

The Edward G. Budd Mfg. Co. has fared no better, in proportion. From our 1942 profits, renegotiation claimed and exacted $9,000,000. The net result was to leave the company, after taxes and small reserve, only $1,296,495 or 1.2 per cent on sales of $115,289,828, instead of the 3.3 per cent to which we were legitimately entitled. And we are still subject to the risks of $18,000,000 of inventory and receivables as well as the reconversion of our plants.

WPB Schedules Loose Spare Anti-Friction Bearings

• • • **WPB has notified** producers of anti-friction bearings that they are to effect a 50 per cent reduction in delivery of loose spare bearings on orders for Navy, Army and Maritime Commission. It was hoped that this would relieve the pressure on the producers of anti-friction bearings. However, a correction has since been sent to all producers reminding them that shipboard spares must be made not only for the Navy but also for the Maritime Commission.



MEET THE CHAMPION "BUILDER-UPPER"

When it comes to rebuilding worn parts, Harcote is the real champion electrode that gets in there—puts on a hard surface that's tough and long-lasting. An important time and money-saver, too! When worn parts would take weeks to replace—Harcote does the job quickly—at a fraction of the new part cost—gives you a part that will outwear the original.

Harcote is ideal for welding on carbon steel, low alloy and high manganese surfaces.

See your P&H representative for procedures. Also ask about P&H electrodes for any other welding requirements.

P&H

Also ask for Information on P&H A.C. and D.C. Welders

General Offices and Factory:
4401 West National Avenue, Milwaukee, Wisconsin

ARMY (E) NAVY

A New Star Has Been Added to P&H's Army-Navy "E"

HARNISCHFEGER CORPORATION
WELDING ELECTRODES • MOTORS • HOISTS P&H ELECTRIC CRANES • ARC WELDERS • EXCAVATORS

Canadian Distribution: The Canadian Fairbanks-Morse Company, Ltd.

Institute Issues New Overseas Shipping Manual

New York

• • • A new steel products manual describing packaging, marking and loading methods for steel products destined for overseas shipments has just been issued by the American Iron & Steel Institute.

The manual was prepared by the Committee on Packaging, Loading and Shipping Problems of the institute aided by government officials.

Copies of the new manual are available from the American Iron & Steel Institute, 350 Fifth Avenue, New York, at $2.50 per copy.

Ruttenberg Takes Leave To Aid CIO Wage Drive

Washington

• • • Harold Ruttenberg, CIO-USW research director and assistant manpower director of the WPB Steel Division, has secured a 60-day leave of absence to return to CIO to participate in negotiations with steel companies in CIO's attempted smashing of the "Little Steel" formula.

Philip J. Clowes, who has been associated with Clinton S. Golden, is WPB vice-chairman on Manpower Requirements and will take Mr. Ruttenberg's place in the Steel Division. Mr. Clowes was former director of CIO District 19, Pittsburgh.

Among the Week's Trade Notes

Genesee Tool Co., Fenton, Mich., has added six factory service and sales district offices to its field organization. They are: Dayton, 710 Harries Building; Cleveland, Penton Building; South Bend, 601 Tower Building; Toledo, 1506 Toledo Trust Building; Pittsburgh, 1217 Grant Building, and Indianapolis, 1109 Fletcher Trust Building.

•

Turco Products, Inc., Los Angeles, has opened a new Houston, Texas, factory.

•

Industrial Machine Co., Racine, Wis., has been organized by John Gellert, Ray J. Eckenrode and Walter W. Hammond.

•

Burgess Battery Co., Madison, Wis., has opened its second branch plant at Monroe, Wis.

•

Ampco Metal, Inc., Milwaukee, has leased the plant of the Hollywood Aluminum Products Co., Hollywood, Cal., to improve and expedite deliveries in the West Coast area. The firm originally planned to build its own plant at Burbank where a tract has been acquired, but was unable to get material and manpower.

WHAT LUBRICANTS . . . Where?

An ever-present problem on which Houghton can help

Steel mills have long since passed through the era when oil was "just oil". They have lubrication engineers whose job it is to lick the trouble-spots and to train men to lubricate intelligently so as to prolong the useful life of massive machines.

Those men know, for the most part, how science has been able to improve on nature through the fortifying of good oils to enable them to protect metal surfaces from wear. How important lubrication is to the mill can be seen by examining the pages of this publication filled with discussion on this vital subject.

Houghton's place in lubrication may be described as "specialists on a volume basis". Some of these applications where Houghton "fortified" lubricants are doing a fine job are listed at the left.

Our technical services to diagnose lubrication troubles and suggest remedies—based on more than 70 years in the business of improving on natural petroleum stocks—are freely available. Write—

Ask about
HOUGHTON LUBRICANTS FOR THESE USES:

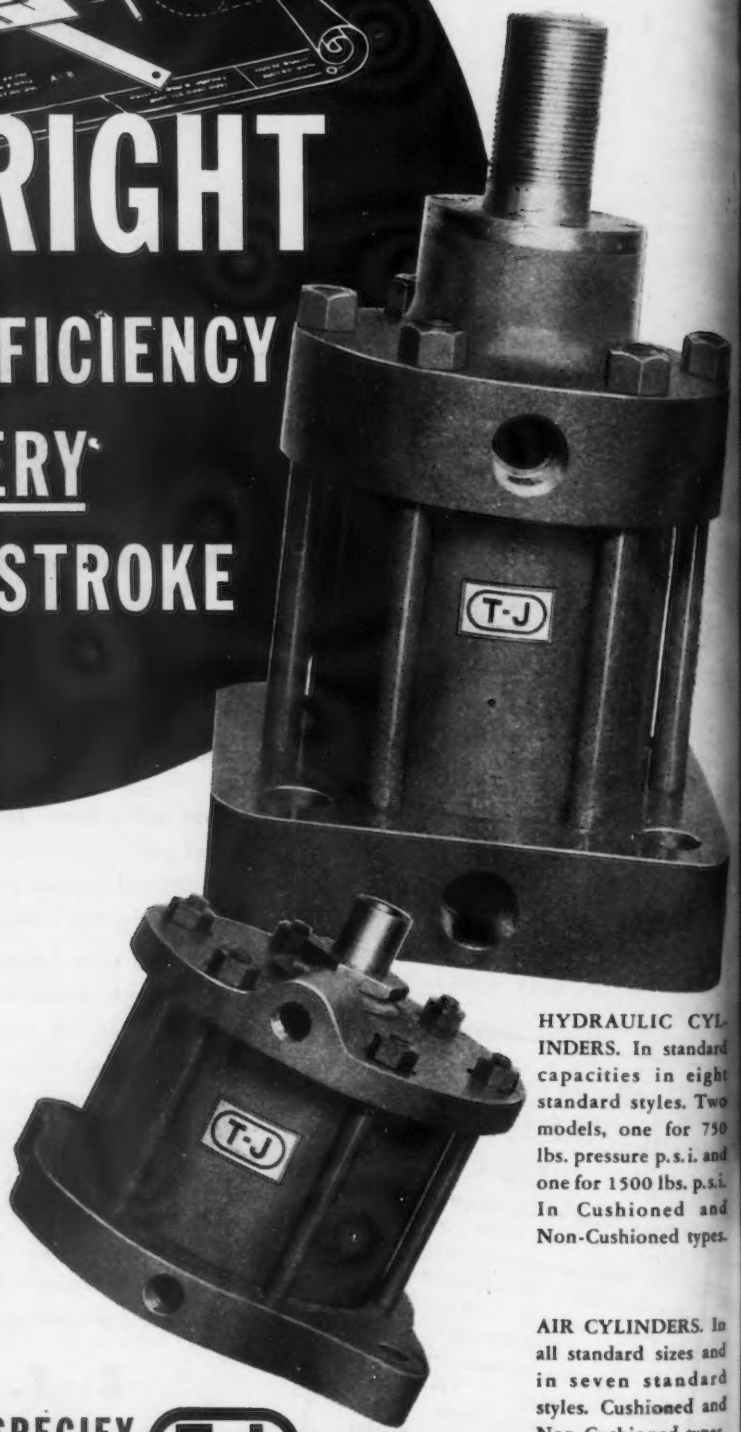
Hand Guns and pressure systems
Roll Necks
Open or closed housings
Transmissions
Mill Reduction Gears
Roller Bearings
Worm Drives
Mill Screws
Heating Furnace Cranes
Cover Journals
Table Bearings
Manipulators
Mill Pinions
Runout Tables
Flying Shears

E. F. HOUGHTON & CO.
PHILADELPHIA
CHICAGO · PITTSBURGH · DETROIT

HOUGHTON'S *Fortified* OILS and GREASES

BUILT RIGHT

FOR TOP EFFICIENCY IN EVERY CYLINDER STROKE



T-J AIR AND HYDRAULIC CYLINDERS are *accurately machined* to assure *right* mounting and highly efficient performance. The mounting surfaces are parallel with (or at right angles to) the bore of the cylinder. All surfaces are strictly inspected for squareness and smoothness. All mounting holes are drilled—not just cored. T-J engineering and experienced workmanship assure *maximum power movement*...long dependability. Write for latest catalogs on T-J Cylinders. The Tomkins-Johnson Co., Jackson, Mich.

HYDRAULIC CYLINDERS. In standard capacities in eight standard styles. Two models, one for 750 lbs. pressure p.s.i. and one for 1500 lbs. p.s.i. In Cushioned and Non-Cushioned types.

AIR CYLINDERS. In all standard sizes and in seven standard styles. Cushioned and Non-Cushioned types.

FOR TOUGH JOBS... SPECIFY T-J

TOMKINS-JOHNSON

RIVITORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS

Sure foot—steady aim!

When the alarm gong sounds "Battle Stations", the slightest slip may mean failure. That is why gun crews on America's "battle wagons" depend on "A.W." Rolled Steel Floor Plate. In vital war plants, refineries, power plants, railroads, "A.W." Floor Plate stops dangerous slipping and falling accidents. Toughest wear will not damage or impair it. Ends floor troubles for good. Write for folder.

Other products include Plates, Sheets, Billets, Blooms, Slabs—Carbon, Copper or Alloy analyses.

ALAN WOOD STEEL COMPANY

MAIN OFFICE AND MILLS: CONSHOHOCKEN, PENNSYLVANIA : SINCE 1826. District Offices and Representatives: Philadelphia, New York, Boston, Atlanta, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Houston, St. Paul, New Orleans, Pittsburgh, Roanoke, Sanford, N. C., St. Louis, Los Angeles, San Francisco, Seattle, Montreal.

Vital to Victory . . . get in the SCRAP

Accomplishments In Regard to NE Steels Reviewed

• • • **For more than a year,** the WPB National Emergency Steel Specifications project has been actively engaged in selecting the minimum number of specifications, compositions, and sections of steel mill products necessary for the war emergency, in order to increase production with existing facilities.

Three national agencies, the American Iron & Steel Institute, Society of Automotive Engineers, and the American Society for Testing Materials have been directing this work in collaboration with the War and Navy Departments. The organization has remained intact since its inception and has operated as a unit of the WPB Conservation Division, maintaining close contact with members of the Steel Division. The administrative committee is assisted in the highly technical phases of its work by twelve technical advisory committees. Recommendations of the Technical Advisory Committees cover the selection of permissible specifications, modification of existing specifications or preparation of new specifications, simplification of sizes and sections, and conservation of critical ferro-alloys. These recommendations are made effective either by the voluntary and cooperative support of producers and consumers, or by the issuance of WPB orders. Of the 250-odd specifications selected by the various TACs, exclusive of aircraft steel specifications, approximately one-half have been modified either by revision or by the issuance of emergency amendments.

An example of the NESS work concerns aircraft steel compositions which were reviewed in January, 1943 by the TAC on Aeronautical Steels and drastically reduced in number to a preferred list. This list was supplemented by a selection of certain alternate compositions designed to conserve nickel, chromium and molybdenum, which the industry was asked to test and use in place of the higher alloy conventional aircraft steels. The use of these alternate NE steels has increased month by month as laboratory and type tests were completed until at the present time this conversion represents 15 to 20 per cent of the total tonnage produced for aircraft uses.

Mandatory orders pertaining to the NESS work have been issued

schedules to Limitation Order L-211. There are now 13 such schedules as follows:

Schedules
1—Concrete Reinforcement Steel
2—Steel Wheels and Tires
4—Structural Steel Shapes
5—Steel Axles and Forgings (Railroad and Transit Services)
6—Mechanical Steel Tubing
7—Rails and Track Accessories
8—Carbon Steel Plates
9—Oil Country Tubular Goods
10—Water Well Tubular Products
11—Steel Pressure Pipe
12—Steel Pressure Tubes
13—Steel Pipe
15—Hot Rolled Carbon Steel Bars

These schedules require the use of selected permissible specifications in the production and delivery of the products covered, and for most of these establish permissible sizes. This selection eliminates all so-called "customer" or private company specifications which impose "non-standard" requirements and therefore tend to slow up production. On some products covered by schedules previous size standards were not in existence.

Other NESS work, now largely completed, covers standardization of specifications for bars, forgings and castings for pressure vessels and pressure piping, and for heavy steel forgings for the shipbuilding industry and those used in turbines, generators, gears, diesel engines, etc. The work on heavy forgings includes also specifications for blooms, billets and slabs for reforging purposes.

Several projects involving simplification of sizes are in progress. These all have required a large amount of investigational work but give promise of great benefits through increased steel mill production, and the conservation of man power.

The products which have been dealt with in the NESS work, and in which study and recommendation have been made by the NESS Technical Advisory Committees, represent approximately 70 per cent of the entire steel production of the United States. Because of the complexity of the industry and the many ramifications of specifications it is impracticable to show in any statistical manner the benefits of the NESS work to the entire steel program. The industry has reported a 5 to 15 per cent increase in effective use of existing facilities for a number of commodities through longer runs, less roll changes, less rejections and greater recoveries, etc. Typical products in this category are steel car wheels, seamless mechanical tubing, structural steel shapes, hot rolled carbon steel bars and sections, and steel pipe. Conservation of critical ferro-alloys was promoted by the modification of specification requirements for alloy steel compositions and by the issuance of specifications covering steels or leaner compositions such as the NE steel which now account for a very substantial proportion of alloy steel production.

While the NESS effort has been directed toward standardization and simplification of products to obtain increased production to meet war needs, most of the work has been of such character as to be beneficial to post-war and peace time production. The extent of cooperation between producers and users will probably determine the extent of continuance of these benefits, after the present controls are rescinded. Cognizant agencies are fully aware of these problems and since steel mill products are largely sold on specifications, it is probable that many of the benefits will be made permanent.

Emergency Provisions to Standard Specifications

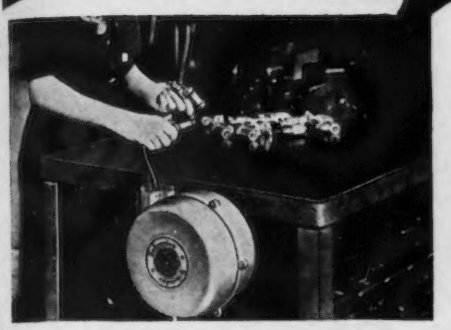
SPECIFICATION DESIGNATION	PRODUCT
Association of American Railroads Manual of Standard and Recommended Practice	
AAR-E-M-101-42	Carbon steel axles for locomotives and cars
AAR-E-M-102-42	Carbon steel forgings for railroads
AAR-E-M-103-42	One wear wheels
AAR-E-M-104-42	Railroad forgings
AAR-E-M-106-42	Locomotive and car tires
AAR-E-M-107-42	Multiple wear wheels
AAR-E-M-111-43	Welded and seamless steel pipe
AAR-E-M-116-42	Structural shapes, plates and bars
AAR-E-M-123-42	Heat treated multiple wear wheels
AAR-E-M-124-42	Heat treated steel tires
American Society of Mechanical Engineers Boiler Construction Code Material Specifications	
ASME-S-4	Seamless drums and other special forgings for pressure vessels
ASME-S-11	Carbon-steel castings
ASME-S-17	Lap-welded and seamless boiler tubes
ASME-S-32	Electric resistance welded boiler tubes
ASME-S-33	Alloy-steel castings for pressure vessels and pressure piping for high temperature service
ASME-S-35	Forged or rolled pipe flanges, fittings, valves and parts
ASME-S-40	Seamless boiler tubes

(*Continued on Page* 132)

HERE'S AIR AT YOUR FINGERTIPS

Ready in a jiffy . . . out of your way when not in use

TUCK-AWAY HOSE REEL UNIVERSAL MOUNTING



Ready for instant use

Easy to reach overhead

Out of the way under bench

Air hose need no longer snake all over the place, tangling in work on the bench, dangling menacingly underfoot . . . ready to trip you up or be trampled upon. The Schrader Tuck-Away Hose Reel ends all that—keeps the hose in a safe, easy-to-reach spot . . . supports small air tools, too—screw drivers, riveters, etc.—prevents them from falling to the floor and breaking.

WORKS LIKE A WINDOWSHADE

You simply pull the hose out to any length you desire and it holds. A slight additional tug and it unlocks and rewinds automatically.

QUICK, EASY-TO-USE, SAFE

An airline in a Tuck-Away Hose Reel is always where you want it, ready for instant use. Pays out easily and smoothly on free turning rollers, rewinds quickly when released without whip or lash. Reeled up, there's no chance for kinking, cutting, bruising, draping in oil or grease, no open invitation to accidents.

PAYS FOR ITSELF IN NO TIME

In use in many plants, the Tuck-Away Hose Reel saves costly hose, prevents man-hour-wasting accidents. And it's built for a lifetime of service. Tuck-Away, Jr., No. 2400, handles 12 ft. of $\frac{3}{8}$" hose; capacity Tuck-Away, Sr., No. 2401, 18 ft. of $\frac{1}{4}$" hose.

FOR IMMEDIATE DELIVERY, *order through your distributor or write us for details and prices. Also send for Catalog No. 10 describing reels for larger size hoses and many other Schrader industrial products designed for efficient air control.*

Schrader

CONTROLS THE AIR

ARMY E NAVY

SCHRADER PRODUCTS FOR INCREASED PRODUCTION—GREATER SAFETY

Air valves, 2, 3, 4 way • Machine Operating Air Sets • blow guns, quick acting couplers • safety devices • air cylinders • air ejection sets • hydraulic gauges

A. SCHRADER'S SON, *Division of Scovill Manufacturing Company, Incorporated,* **BROOKLYN, NEW YORK**

AS QUICK AS SHE CAN SAY JACK ROBINSON...

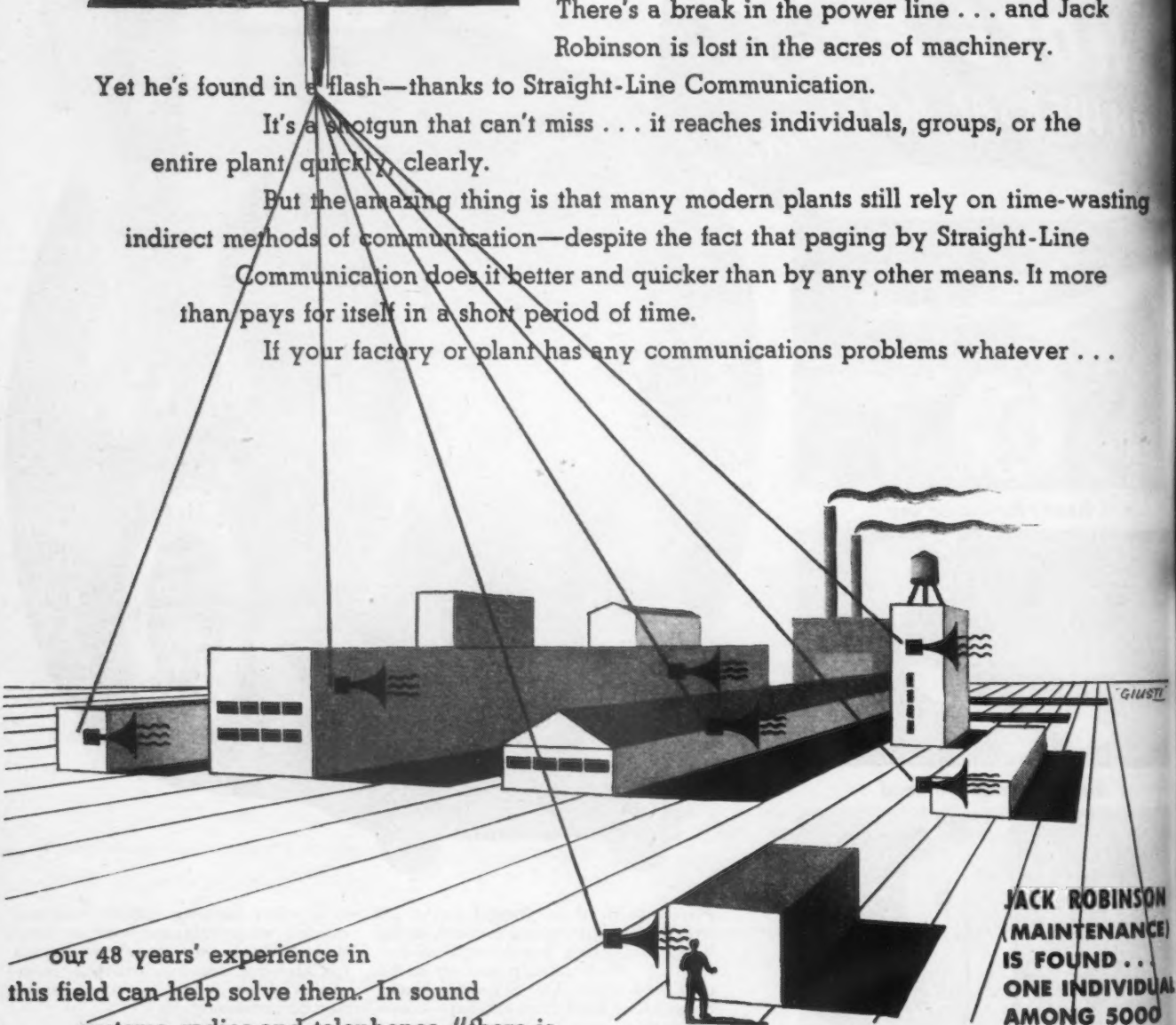
There's a break in the power line . . . and Jack Robinson is lost in the acres of machinery.

Yet he's found in a flash—thanks to Straight-Line Communication.

It's a shotgun that can't miss . . . it reaches individuals, groups, or the entire plant quickly, clearly.

But the amazing thing is that many modern plants still rely on time-wasting indirect methods of communication—despite the fact that paging by Straight-Line Communication does it better and quicker than by any other means. It more than pays for itself in a short period of time.

If your factory or plant has any communications problems whatever . . .



JACK ROBINSON (MAINTENANCE) IS FOUND . . . ONE INDIVIDUAL AMONG 5000

our 48 years' experience in this field can help solve them. In sound systems, radios and telephones, "there is nothing finer than a Stromberg-Carlson." Why not get in touch with the Sound Systems Division of the Stromberg-Carlson Company, 100 Carlson Road, Rochester, New York. Write for free booklet No. 1937.

STROMBERG-CARLSON

STRAIGHT-LINE COMMUNICATION SAVES MANPOWER • SPEEDS THE WORK TO VICTORY

When you need a special machine tool

Massive spindle used in the 12 ft. stroke double-end deep hole drilling machine shown below. Machine drills 90 MM gun tubes from both ends.

BIG or SMALL

. . . consider these 4 important advantages in having it designed and built by us.

The size of your part to be machined, its shape and material, its required operations and production are the usual factors which determine the design of your special machine. You'll find all the facilities for analyzing the problem up through final manufacturing and testing at W. F. and John Barnes.

1st ENGINEERING SKILL to design and build drilling, boring, tapping, milling and honing machines to suit any part, regardless of size. W. F. and John Barnes Engineers, familiar with processing and cost-saving methods, have the ability to analyze a machine problem, determine the most productive machining sequence, and design and build the machine that best fits your specific requirements.

2nd EXPERIENCE in building production machines of all types and sizes for the automotive and other peace-time industries. As specialists in machine designing for both low and high production, W. F. and John Barnes Company has for years been solving machining problems for manufacturers of products ranging from small pencil sharpeners to huge gun barrels and locomotive equipment.

3rd EQUIPMENT LARGE ENOUGH to machine the long, heavy beds and other component parts required for large machines. W. F. and John Barnes through years of experience manufacturing special production machines, has built up a reserve of equipment with the capacity to handle parts of any size or shape.

4th ASSEMBLY CAPACITY to handle any machine regardless of size. Through a constant program of expansion, W. F. and John Barnes has increased their facilities until now there is ample space for the erection and complete testing of large equipment before shipping.

W.F. & JOHN BARNES

This drilling and tapping machine was designed to machine an airplane engine crankcase. It is built from standard Barnes hydraulic self-contained units and performs six operations. Although not the smallest W. F. and John Barnes Machine built; comparing it with the machine above illustrates the wide range of machine sizes built in our plant.

Proof of the success of the Barnes' method of machine design is contained in this set of 8 bulletins. Each traces a machining problem from the original production requirements to the final machine design. Each may suggest a tooling or production setup that you can use today — valuable file information for tomorrow. Ask for free set of Bulletins 1243.

W. F. and JOHN BARNES

335 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

Emergency Provisions to Standard Specifications

(*Continued from Page* 128)

SPECIFICATION DESIGNATION	PRODUCT
ASME-S-48	Carbon-molybdenum boiler and superheater tubes
ASME-S-52	Seamless alloy-steel boiler and superheater tubes
ASME-S-56	Carbon-steel castings for fusion welding
ASME-S-57	Alloy-steel castings for fusion welding for high temperature service
ASME-S-65	Electric-resistance-welded carbon molybdenum boiler and superheater tubes
ASME-SA-95	Carbon-steel castings for high temperature service
	American Railway Engineering Association Specifications
AREA-1942	Open-hearth steel rails
AREA-1939	Heat-treated carbon-steel track bolts
AREA-1934	Soft steel cut track spikes
AREA-1942	High carbon steel track spikes
AREA-1942	Soft and medium steel tie plates
AREA-1942	Hot worked, high carbon steel tie plates
	American Society for Testing Materials Specifications
ASTM-A1-39	Open-hearth steel rails
ASTM-A21-36	Carbon steel axles for cars
ASTM-A25-41	Wrought steel wheels, electric service
ASTM-A26-39	Steel tires for export service
ASTM-A27-42	Carbon-steel castings
ASTM-A53-42	Water well pipe
ASTM-A57-39	Multiple wear wheels
ASTM-A67-33	Steel tie plates
ASTM-A83-42	Lap-welded and seamless boiler tubes
ASTM-A87-42	Carbon and alloy-steel castings
ASTM-A95-41	Carbon-steel castings for high temperature service
ASTM-A120-42	Welded and seamless steel pipe
ASTM-A134-42	Electric-fusion welded steel pipe
ASTM-A135-42	Electric-resistance-welded steel pipe
ASTM-A139-42	Electric-fusion-welded steel pipe
ASTM-A157-42	Alloy-steel castings for pressure vessels and pressure piping for high temperature service
ASTM-A158-42T	Alloy steel pressure pipe
ASTM-A160-39	Reinforcing steel
ASTM-A161-40	Seamless carbon-molybdenum still tubes
ASTM-A178-40	Electric-resistance welded boiler tubes
ASTM-A179-42	Seamless cold drawn heat exchanger and condenser tubes
ASTM-A182-40	Forged or rolled pipe flanges, fittings, valves and parts
ASTM-A183-40T	Heat-treated carbon steel track bolts
ASTM-A192-40	Seamless boiler tubes
ASTM-A199-40	Alloy steel heat exchanger and condenser tubes
ASTM-A200-40	Alloy steel still tubes
ASTM-A206-42T	Carbon-molybdenum pressure pipe
ASTM-A209-41T	Carbon-molybdenum boiler and superheater tubes
ASTM-A211-40	Spiral-welded steel or iron pipe
ASTM-A213-42	Seamless alloy-steel boiler and superheater tubes
ASTM-A214-42	Electric resistance welded heat exchanger and condenser tubes
ASTM-A215-41	Carbon-steel castings for fusion welding
ASTM-A216-42T	Carbon-steel castings for fusion welding
ASTM-A217-42T	Alloy-steel castings for fusion welding for high temperature service
ASTM-A226-40	Electric resistance welded boiler and superheater tubes
ASTM-A234-42	Forged welding fittings
ASTM-A235-42	Forgings for general industrial use
ASTM-A236-42	Carbon steel forgings for locomotives and cars
ASTM-A237-42	Alloy-steel forgings for general industrial use
ASTM-A238-42	Alloy steel forgings for locomotives and cars
ASTM-A241-41	Hot worked high carbon steel tie plates
ASTM-A248-41T	Carbon and alloy-steel blooms, billets and slabs for forgings
ASTM-A250-41T	Electric resistance welded carbon molybdenum boiler and superheater tubes
	American Petroleum Institute Specifications
API Standard No. 5-A	Oil country tubular goods
API Standard No. 5-L	Line pipe
	American Water Works Association Specifications
AWWA-7A.4-1941	Steel water pipe
AWWA-7A.3-1940-TR	Steel water pipe
	Underwriters Laboratories, Inc., Standard
U. L. Sp. I—888-38-43	Steel pipe lines
	Federal Specifications
Federal QQ-B-71	Reinforcing steel
Federal QQ-S-741	Carbon steel plates, structural
Federal WW-P-403	Steel pipe
	U. S. Army Specifications
Army 57-114	Structural steel
Army 57-114	Carbon steel plates, ordnance materiel
	Navy Department Specifications
Navy 22Y	Structural steel
Navy 22Y	Carbon steel plates for welding
Navy 44T3	Seamless boiler tubes
	U. S. Coast Guard Specifications
Coast Guard MIN-51.11	Carbon-molybdenum pressure pipe
Coast Guard MIN-51.10	Carbon-molybdenum boiler and superheater tubes
Coast Guard MIN-51.11a	Welded and seamless steel pipe
Coast Guard MIN-51.11b	Electric-resistance welded steel pipe
ASTM-ES-5a	Carbon-chromium ball and roller bearing steels
ASTM-ES-21	Forgings for magnetic retaining rings
ASTM-ES-22	Forgings for non-magnetic retaining rings
ASTM-ES-23	Forgings for rings for main reduction gears
ASTM-ES-24	Forgings for pinions for main reduction gears
ASTM-ES-25	Forgings for turbine generator rotors and shafts
ASTM-ES-26	Forgings for turbine rotors and shafts
ASTM-ES-27	Forgings for turbine bucket wheels
ASTM-Proposed	Carbon-steel blooms, billets and slabs for reforging
ASTM-Proposed	Alloy-steel blooms, billets and slabs for reforging

Here's a Starter You Can Really Get At!

Loosen two screws and the arc chamber cover comes off. You can inspect every contact surface at a glance.

The entire armature and movable contact assembly can be lifted off after two more screws come out. You can easily slip off the magnet coil after disconnecting two wires from its screw type terminals.

Contacts are attached with separate screws—you can remove or replace them without disturbing any wiring—and a screw driver is all you need.

Peak operating efficiency and long life of electric motor starting equipment depend largely upon regular inspection and occasional servicing. Today, with every minute at a premium, this inspection and servicing job is more important than ever.

The complete accessibility of Square D starters means faster, easier inspection and servicing. Their simple construction enables the electrician to exchange magnet coils, contacts or overload relays in practically no time at all—using only a screw driver.

Write for Catalog Bulletin 8536 which describes Square D's complete line of A.C. magnetic starters. The starter illustrated is Size I for 3 phase motors up to 5 HP. at 220 volts or 7½ HP. at 440 volts. One smaller, and three larger sizes are also available.

ELECTRICAL EQUIPMENT • KOLLSMAN AIRCRAFT INSTRUMENTS

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

Warehouse Small Orders Clarified; New Limits and Distinctions Outlined

Cleveland

• • • **A summary of the distinctions** between the two types of small orders for warehouse delivery and the rules applicable to each of them has been released by the headquarters of the Steel Products Warehouse Association here. In defining the two types of small orders, it was pointed out that one carries the symbol SO and the other a certification. Each differs in rating, quantity limitation and are reported differently on Form WPB-2888.

Only one kind of customer can place an SO (symbol) order with you: a manufacturer of a Class A product under the Controlled Materials Plan. Assume that a manufacturer with an authorized production schedule needs a Class A product to put into what he is making. Assume, too, that the quarterly supply of the particular Class A product he needs requires three tons or less of steel to produce. In that case, the manufacturer requiring the Class A product can place an order with the maker of that product without making an allotment of steel. Such an order is called a Small Order and carries the symbol SO.

The Class A product maker uses the symbol SO to obtain steel for the manufacture of products sold on SO orders. Now we have said that a manufacturer can place a small order with a maker of Class A products only if three tons or less of steel will be needed during a quarter in the manufacture of the Class A product required. However, a Class A product maker may receive many small orders and he may wish to order steel for a number of them at the same time.

Therefore, SO orders placed with a warehouse will vary greatly in size. They may call for delivery of less than three tons or they may ask for 15 or 18 tons. (If they call for more than 20 tons, WPB permission to ship must be obtained.)

An SO order is an authorized controlled material order.

An SO order need not carry any quarterly designation but must specify the month in which delivery is required. If more than three tons are ordered, the customer should indicate on his purchase order that it represents combined requirements.

SO orders should be reported in Item 631 of Form WPB-2888, and in Item 2 of Form WPB-2444.

In a recent revision in CMP Regulation 1, WPB acted to protect users of the small order procedure who may —through no fault of their own—exceed the quarterly tonnage limits. This may lead to a wider use of the SO symbol on orders for Class A products.

The other kind of small order. For sake of clarity, we will assign a new name to this kind of small order. Call it a d-4 order because the rules applying to it are described in Paragraph (d) (4) (ii) of CMP Regulation 4.

A d-4 order can be placed by any person authorized under WPB regulations to use steel. This type of order is designed for the person whose total carbon steel requirements for a quarter do not exceed 10 tons. If a person buys any steel at all on a d-4 order, that person's total receipts of carbon steel from all sources during the quarter may not exceed 10 tons.

Assume that a manufacturer has an allotment good for five tons in a quarter. He is permitted to use that allotment and still buy five more tons on a d-4 order. Or he may disregard or return his allotment and buy 10 tons under Paragraph (d) (4) (ii). But under no circumstances may he use his five-ton allotment and then buy 10 tons more on a d-4 order. And if a manufacturer has an allotment for more than 10 tons (and uses it), he cannot buy any steel at all under Paragraph (d) (4) (ii).

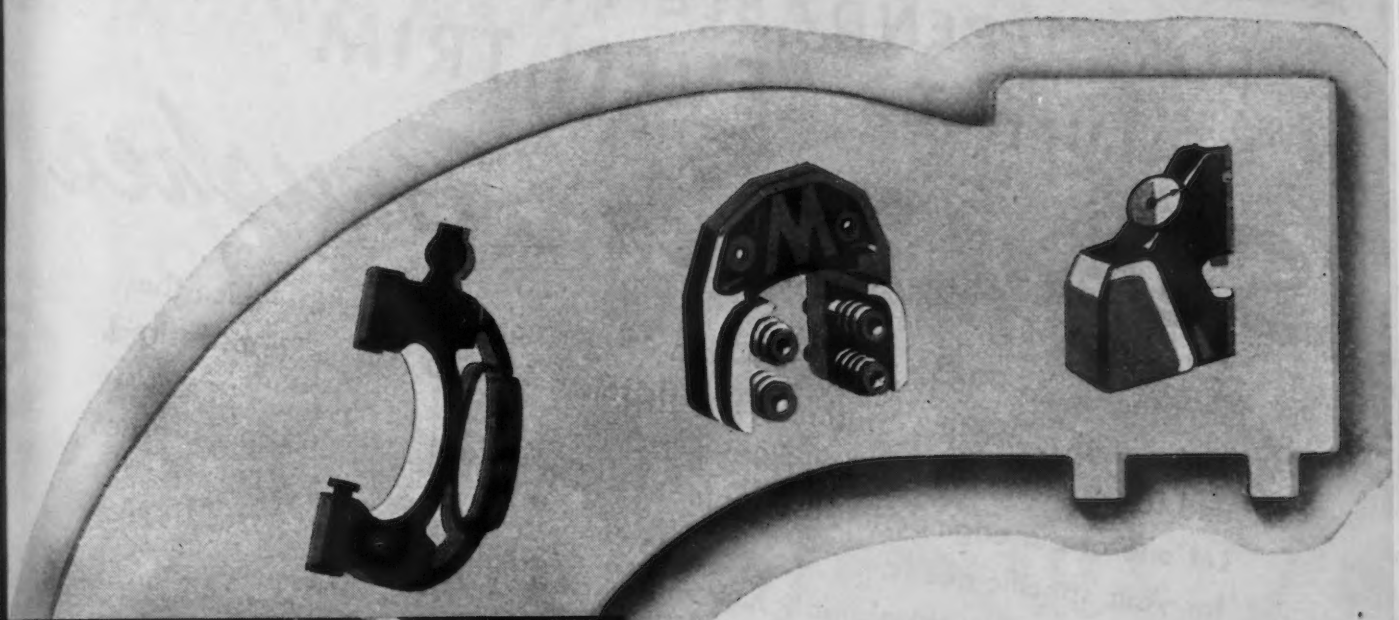
Therefore, d-4 orders will be strictly limited in size—a maximum of 10 tons in any quarter from a single customer. Formerly, only one ton of tin plate or galvanized sheet could be sold in a quarter as part of the 10-ton overall limit. Now you can sell to a single customer in a single quarter up to 10 tons of any flat rolled product or a total of 10 tons of all flat rolled products.

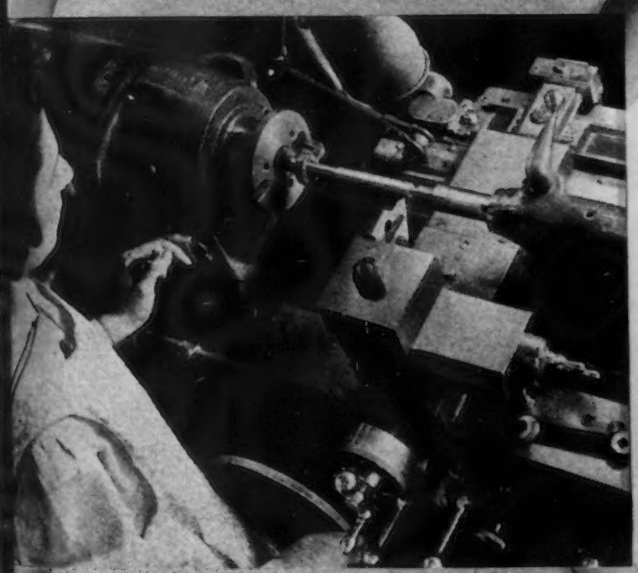
A d-4 order will be accompanied by the certification form contained in Paragraph (d) (4). The standard certification form (CMP-7) previously was permitted as an alternative—but it led to confusion.

A d-4 order is not an authorized controlled material order.

Deliveries on d-4 orders are reported on WPB-2888 in Item 632.

Precision Gauges came first





Chasing thread gauge laps on a Monarch Sensitive Precision Toolmaker's Lathe, in a large precision gauge plant.

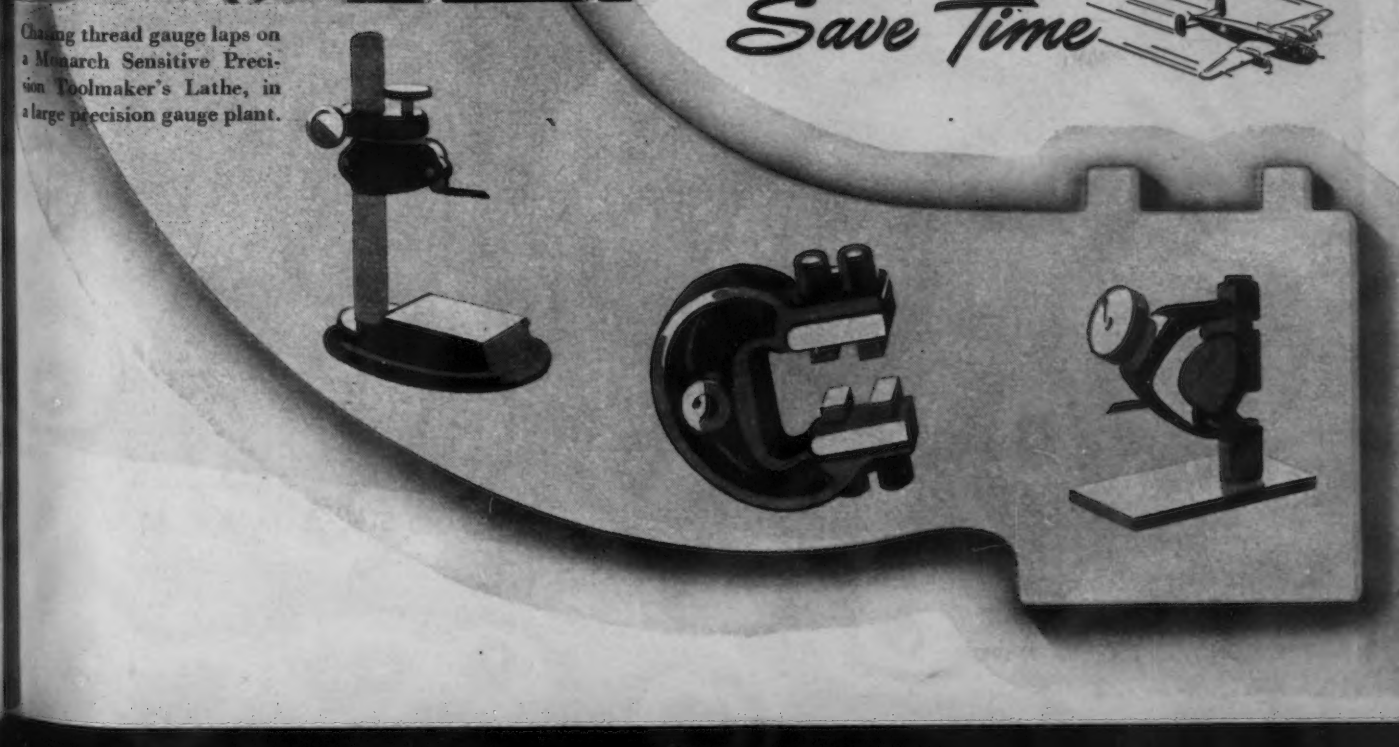
Before war production could start, precision gauges to insure high precision and interchangeability of parts, had to be made in undreamed-of quantities. A mere handful of gauge manufacturers who had the "know-how" were given the job.

Monarch's assignment for 1941 was more than double any previous year's production of tool and gauge maker's lathes. On November 11th, 1941, we got a Navy "E" award for more than fulfilling our assignment.

The precision gauge making for war production is now well in hand. Soon, new precision gauges for better peacetime production will be needed. The hundreds of Monarch lathes in the gauge makers plants still retain their in-built accuracy and will do as good Peacetime job as they did a War job in the toolrooms of America.

MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

MONARCH LATHES
Save Time



IS *One Part* PUTTING A HIDDEN TAX ON YOUR BUSINESS?

IS some difficult part boosting your cost curves up and forcing production curves down? . . . putting a hidden "withholding tax" on your investment in equipment and men?

Contact KAYDON

If current war production or postwar product planning overtaxes your manufacturing capacity . . . or if hard-to-make parts slow down your schedule . . . the precision production facilities of Kaydon may offer a practical answer to your problem. Well equipped to specialize in production of difficult parts, Kaydon has capacity now to assure "on time" deliveries of high precision units, made exactly as specified.

CAPACITY Immediately AVAILABLE for ball and roller BEARINGS Size 6" to 60"

For excellence in production of extremely precise, unusually large ball and roller bearings.

THE KAYDON ENGINEERING CORP.

McCRACKEN STREET • MUSKEGON 81, MICH.

Specialists in Difficult Manufacturing

Canada Preceding U. S. In Reconversion Trend

Toronto

• • • **Under Order No. S.C. 33,** which deals with purchases and stocks of iron and steel in Canada, issued over the signature of M. A. Hoey, associate Steel Controller, a number of revisions are indicated in the policy of the government which will make larger quantities of these materials available for civilian manufacturing operations. With the release of the new Order, the Steel Controller rescinds Order No. S.C. 17, which set up the use of Form S.C. 1000 when ordering mill forms and secondary products, also Order No. S.C. 22, which restricted inventories of iron and steel. Order No. S.C. 33, further provides that on and after Jan. 1, 1944, inventories of iron and steel must be confined to 60 days' requirements, instead of the 90 days now.

By the release of Order S.C. 33, most standard secondary products have been removed from legal steel control and the office of the Steel Controller no longer requires formal procedure with regard to the purchase and sale stock on hand of these shelf items. Form S.C. 1000 is replaced by Form S.C. 1020 (revised Oct. 1, 1943) on a limited list of steel products which are shown in Schedule "A" to Order No. S.C. 33, parts 1 and 2.

Consumers are informed that in ordering in Canada steel in the forms shown in Part 1, of Schedule "A," must show on the face of the purchase order, or on Form S.C. 1020 revised: Purpose of use fully described; PCS percentage pattern, if more than one use; stocks on hand of each item ordered, at time order is placed; total quantities outstanding undelivered on all purchase orders; how long the quantities ordered will last. If the order is placed with a steel producer, send one copy to Steel Control, Ottawa, with the above information on the face of the order or accompanied by the completed Form S.C. 1020. If the order is placed with a warehouse or jobber, send the order to the supplier with the above information. If the following minimum quantities for delivery out of warehouse stock are ordered the above information is not required: If the steel ordered is stainless steel or if the quantity ordered is less than 100 lb. of tool steel or less than 8000 lb. of wrought iron and/or carbon steel, or less than 2000 lb. of any alloy steel other than stainless steel or tool steel.

PERSONALS

JAMES E. GLEASON, president, Gleason Works, Rochester, New York.

W. C. PALMER, manager of sales of wire and specialties division, John A. Roebling's Sons, Co., Trenton, N. J.

• **Thomas T. Watson,** who has been research metallurgist in charge of the research department of Lukens Steel Co., Coatesville, Pa., since 1939, has been appointed director of research of Lukens and its divisions, By-Products Steel Corp. and Lukenweld, Inc. At the same time **D. Bruce Johnston** was appointed assistant to the director of research and **Samuel D. Lemmon** was made research metallurgist.

• **W. C. Palmer** associated with the John A. Roebling's Sons Co. since 1926, has been appointed manager of sales of round, flat wire and specialties division, Trenton, N. J. He was formerly assistant branch manager of the company at Cleveland.

• **Harry S. Tweedy** has been made manager, field service division, Detrex Corp., Detroit. Mr. Tweedy has been chief inspector of production in all Detrex plants since 1940. Prior to that time he served as a design engineer.

• **James E. Gleason,** president of the Gleason Works, Rochester, N. Y., recently celebrated his diamond birthday. Mr. Gleason, whose father founded the Gleason company in 1865, is well known for his inventions of machines to make new types of gears.

• **Harry G. Barr** was recently elected vice-president in charge of all purchases for the J. I. Case Co., Racine, Wis. He has been with Case since 1910, and has worked in various departments of the factory, assembling and testing steam engines and threshers. In 1937 he was promoted to the position of general purchasing agent for all Case factories.

• **G. Herbert Marcy,** former sales manager of the Gillette Safety Razor Co., Boston and more recently serving on the WLB has returned to the company as assistant to the president. He will direct the firm's post-war plans.

• **E. L. Huff,** formerly electrical engineer at the Brackenridge, Pa. plant of the Allegheny Ludlum Steel Corp., has been appointed chief engineer of all the plants of the corporation.

• **Ralph G. Caulley,** formerly with Republic Steel Corp., has been named director of purchases of Fruehauf Trailer Co.

• **Henry R. Michel,** purchasing agent for Westinghouse Electric & Mfg. Co. East Pittsburgh Works since 1938, has been awarded the Westinghouse Order of Merit.

• **Dr. Joseph C. Donchess** has been appointed chief surgeon of the two Gary, Ind., plants of Carnegie-Illinois Steel Corp, succeeding the late Dr. Frank W. Merritt.

• **William G. Theisinger,** who has been director of welding research at Lukens Steel Co., Coatesville, Pa., has been appointed assistant to **D. S. Wolcott,** vice-president. Dr. Theisinger joined Lukens in 1935 as welding and metallurgical engineer.

• **Hamlin A. Caldwell,** assistant chief metallurgist of the Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., has been made chief metallurgist. He succeeds the late **A. E. Kunze.**

• **T. H. Glaser** has been appointed installation engineer and tooling consultant for the Gray-Mills Co., Chicago.

• **G. K. Hayes,** who has represented the John A. Roebling's Sons Co., Trenton, N. J., as a salesman out of the company's Cleveland Branch for several years, has been appointed assistant manager of that branch.

• **J. W. Whiteside** has been appointed buyer in the tube division of the electronics department, General Electric Co., Schenectady, N. Y. He joined the company in 1929 to work in the accounting department of International General Electric Co. In 1933, he was sent to China to work for the China General Edison Co. in Shanghai. He returned to this country in 1941 to work for the motor division of General Electric.

• **R. P. Whitmyre** has been appointed assistant to the purchasing agent of the General Electric Co.'s electronics department.

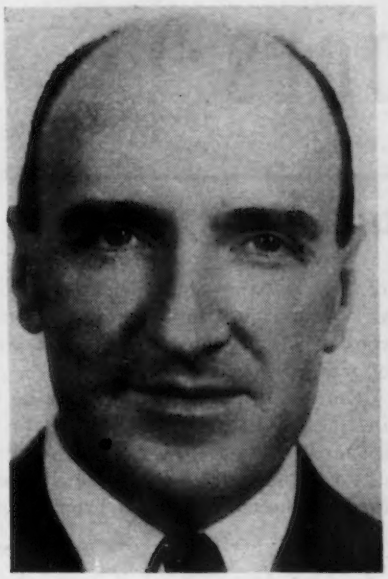
• **W. E. Allen,** home route clerk in the car service department of the Norfolk & Western Railway Co., Roanoke, Va., has been made superintendent of car service, succeeding the late **J. D. Woodroof.**

• **Carl Nyquist,** secretary and treasurer of the Rock Island Lines, was elected chairman of the treasury division, Association of American Railroads recently.

• **Harry J. Sturm** has been appointed a member of the administrative staff of the Quaker Chemical Products Corp., Conshohocken, Pa. Mr. Sturm recently received an honorable discharge from the Army after participating in the African campaign.

• **Arthur Smith Jr.,** of the magnesium division of the Dow Chemical Co., has been named head of magnesium sales for the Southwest territory, with headquarters in the St. Louis office.

HARRY S. TWEEDY, manager, field service, Detrex Corp., Detroit.



THOMAS T. WATSON, director of research, Lukens Steel Co., Coatesville, Pa.

HARRY G. BARR, vice-president in charge of purchasing, J. I. Case Co., Racine, Wis.

• **F. R. Fishback** has been elected chairman of the board of the Electric Controller & Mfg. Co., Cleveland. Mr. Fishback had been president of the company since 1925. **R. G. Widdows**, former vice-president, was elected president. **N. R. Richardson** and **A. C. Dyer** were both elected vice-presidents of the company.

• **Joseph A. Dragotto**, formerly in the sales department of the Solar Corp., Milwaukee, has been made personnel manager.

• **Keith P. Rindfleisch** has been appointed assistant manager of the United States Steel Supply Co. Cleveland office. He has been with the firm since 1930 at the Milwaukee warehouse.

• **James P. Stewart** has been made assistant general manager and resident executive in charge of the McCulloch Engineering Corp., Milwaukee, a division of Borg-Warner Corp.

• **W. Earle Shumway** has been appointed sales manager of the western region by Norton Co., Worcester, succeeding **R. M. Johnson** who was recently appointed general sales manager. **Raymond E. Taylor** has been appointed Chicago district manager succeeding **Mr. Shumway**. Mr. Taylor has been with Norton Co. since 1920.

• **Frank W. Curtis** has recently resigned as chief engineer of Van Norman Co. and is now associated with the Induction Heating Corp., New York, as development engineer.

• **M. M. Clark** is now sales engineer of Metal Parts & Equipment Company, Chicago. Mr. Clark was formerly manager of bar and semifinished materials bureau, metallurgical division, Carnegie-Illinois Steel Corp.

• **John H. McGill** has been named assistant controller of the B. F. Goodrich Co., Akron, Ohio. He succeeds **H. V. Gaertner**, recently appointed assistant treasurer. Mr. McGill has been the factory auditor for the last 10 years.

• **John D. Biggers**, president of the Libbey-Owens Ford Glass Co., was elected a director of the Baltimore & Ohio Railroad Co. recently. He succeeds the late **Joseph E. Widener**.

• **T. O. Eaton** has been appointed manager of sales, power transformer section, at General Electric's Pittsfield Works. Mr. Eaton was formerly assistant manager of sales, power transformer section, Pittsfield Works.

• **Albert J. Danner** has been appointed general custodian of records, Rock Island Lines, with headquarters in Chicago. Mr. Danner, formerly custodian of records, Cedar Rapids, Ia., succeeds the late Martin A. O'Hare.

• **Dr. Frank C. Croxton** has been named supervisor of organic chemistry at Battelle Memorial Institute, Columbus, Ohio.

• **Peter L. Lenz** has been made manager of the Middle Atlantic District Mfg. & Repair Department, Westinghouse Electric & Mfg. Co., Pittsburgh. Mr. Lenz, who was formerly manager of the Homewood Mfg. & Repair Plant, Pittsburgh, will make his headquarters in Philadelphia.

OBITUARY...

• **Harry C. Merritt**, former vice-president and general manager of the Allis-Chalmers Milwaukee tractor division, died Nov. 18. Mr. Merritt had been with the Allis-Chalmers tractor division for 15 years. He was awarded the McCormick medal just before his retirement several years ago.

• **D. J. Shelton**, president and general manager of the Marion Steam Shovel Co., Marion, Ohio, died Nov. 27. He had been president and general manager of the company since 1941.

• **John V. Culliney**, retired, formerly general superintendent, American Iron & Steel Mfg. Co., Lebanon, Pa., and afterwards manager of Lake Iron Co., Cleveland, died Nov. 23, after a prolonged illness. He was 78 years of age.

• **Maurice M. Hatten**, purchasing agent for the Electro Dynamic Works of the Electric Boat Co., Bayonne, N. J., died recently.

MACHINE TOOLS

. . . News and Market Activities

Four Point Post-War Plan Offered

Milwaukee

• • • **Frederick Salditt,** vice-president of the Harnischfeger Corp., Milwaukee, has been giving thought to the matter of disposing of vast government owned equipment and supplies after the war without disturbing post war business.

In planning for the disposition of government surplus equipment, Salditt believes there are four major objectives. They are a maximum of jobs in private industry, a maximum number of tax producing incomes to aid in servicing and retiring the national debt, fastest possible demobolization of government agencies to reduce expenditures, and greatest possible revenue for government from the disposition of surplus equipment.

Salditt would set up proper safeguards to insure that industry, if permitted to handle disposition of equipment, would sell it in a way that would not disrupt production and which would bring maximum returns to the government. A tentative plan for Salditt's industry (excavating machinery, cranes and arc welding machines) would include these points:

Each manufacturer will be given a list of all new equipment of his original manufacture (model and serial numbers) and location of the equipment.

The manufacturer will contract to repurchase the equipment from the government at, for example, 75 per cent of his then prevailing shop cost of similar equipment.

The manufacturer will undertake to resell this equipment at a price 25 to 30 per cent below the price of similar new equipment that he then manufactures. The concession in price would compensate for the use of substitute materials in the war equipment due to the scarcity of normal material.

The manufacturer will agree to resell this surplus equipment at the rate of one surplus machine to each three new machines.

The manufacturer will pay the government for this surplus equipment as and when he receives payments from the ultimate purchaser.

ASME Discuss Metal Cutting Problems

(CONCLUDED FROM PAGE 78)

for evaluating the machinability of single point tools, cutting fluids or materials cut, as prepared by Technical Committee 21 of the ASA Sectional Committee B5, was presented by Prof. O. W. Boston, University of Michigan. After calling attention to all the factors involved—and there are a host of them—Professor Boston indicated that for a given test, there should be but one variable, namely the material, the tools or the cutting fluid. For each class of material, there is naturally a tool form best suited for the purpose and preliminary tests are desirable to establish optimum shapes.

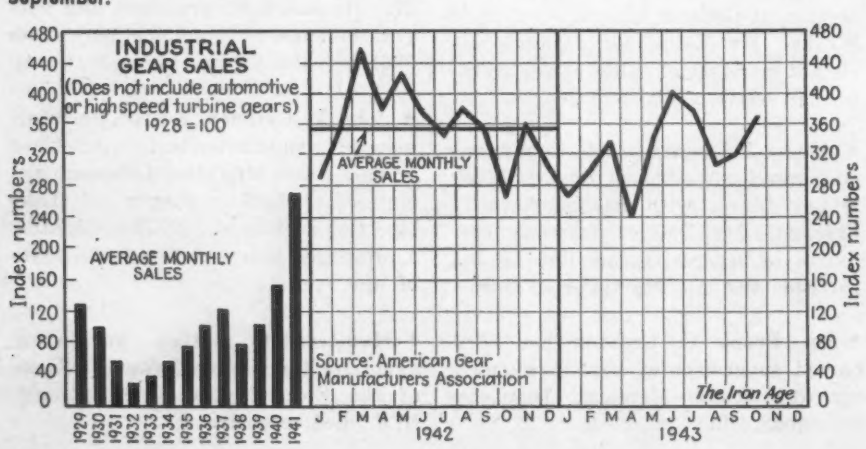
In the final analysis tool life is related to cutting speed in feet per min. The formula expressing the relation between cutting speed and tool life between grinds for a given material, feed and depth of cut is $VT^n = C$, where V is the velocity in feet per min., T the time in minutes, C a constant equal to the cutting speed for a 1 min. tool life and n is the slope of the straight line obtained by plotting the test data on log-log paper. It will be found that as the cutting speed is decreased, the life is extended, but all points will fall along the same sloping line for any given condition other than speed. This offers a simple method for comparing the effect of one cutting fluid with another.

In another paper on cutting fluid recommendations, Professor Boston indicated that whereas one cutting fluid might show up well with a heavy feed, it might show a correspondingly lower tool life curve when the cut is light. He presented specific cutting fluid recommendations as prepared by the Subcommittee on Cutting Fluid Recommendations of the Independent Research Committee, headed by Joseph Geschelin, Detroit technical editor, *Automotive and Aviation Industries.* In the same report, machinability rating of various ferrous and nonferrous materials were given.

A graphical solution of the cutting tool speed-life formula $VT^n = C$, using a constant exponent of $n = 0.125$ for a wide range of materials cut, has been worked out by W. W. Gilbert and W. C. Truckenmiller, department of metal processing, University of Michigan. For tool life, their charts take into account speed, feed, depth of cut, tool material and Brinell hardness of the material cut. Similar charts have been worked out for power requirements.

October Gear Sales Up 15 Per Cent

. . . The gearing industry as represented by the members of the American Gear Manufacturers Association shows an increase of 15 per cent in the business booked in October, as compared with September. The October index figure was 368 as compared with 320 for September.



This little bit does 4 big jobs on Phillips Screws

Here's a brand new twist in power screw drivers: Apex insert type bits. And they are ready to go to work for you right now on practically any type of power driver in use today. They'll save in these important ways:

Saves Money

Apex insert type bits cut down the many different sizes of Phillips bits usually needed. Once you've bought the holders you need, you carry only the insert tips. One range of inserts fits various sizes of holders.

Saves Steel

Apex insert tips are small, release vitally needed steel for other war uses.

Saves Replacements

Insert bits last longer because the float between the holder and insert permit easier direct alignment with recess in screw.

Saves Handling

It's no longer necessary to return used driver bits for reconditioning. Cost of new inserts amounts to approximately the same as reconditioning charges.

Get the whole line-up on these thrifty, time-saving Apex bits, and the holders to fit practically all makes of drivers. Write for Bulletin **102**

APEX

THE APEX MACHINE & TOOL COMPANY • DAYTON, OHIO

NON-FERROUS METALS

. . . News and Market Activities

Copper Recovery Ends This Year

• • • **Because its** duties have been accomplished, the Copper Recovery Corp. will be dissolved this month. It was organized in 1942 as agent for Metals Reserve to purchase frozen inventories and resell them to brass mills and ingot makers for remelt. About 175,000 net tons of material were reported of which Copper Recovery will have purchased one-third before its final dissolution.

President John P. Sullivan, formerly secretary and treasurer of the Commodity Exchange Clearing Association, has submitted his resignation effective Dec. 31, 1943. Unfinished business will be completed by Murray Cook, 155 East 44th Street, New York, agent for Metals Reserve. Mr. Cook is also completing the affairs of the aluminum recovery program.

•

Lead Output Needs Watching

• • • **The position of lead,** while not critical, requires careful watching, according to the consensus of the last meeting of the Lead Producers Industry Advisory Committee. Several producers pointed to the steadily increasing withdrawals from stockpile, which if continued will be cause for alarm.

While undoubtedly there will be considerable decrease in demand for lead in the small arms program for 1944, there will be compensating increases in demand for other essential purposes, such as batteries, cables, tetraethyl lead, etc. Most of these items go into the munitions program.

On the basis of present demands of the munitions program, consumption of lead in 1944 should equal 1943 consumption, it was said.

On the other hand, the production of lead from domestic mines promises to decline owing to labor shortages, but every effort will be made to maintain present production. Domestic mine production amounts to about 40 per cent of the total consumption, the deficit being made up from imports and secondary lead. Imports may increase somewhat during the coming year, but the recovery of secondary lead is likely to be hampered by labor shortages.

The industry was informed that WPB had approved the recommendations of the Tin-Lead Division with respect to domestic mines subject to review during the beginning of 1944 as follows: Present producing mines should be kept in operation. Present labor forces should be maintained through deferment of mine, mill and smelter workers. It is recommended that no new projects for the production of lead involving government financing be approved. No lead mine not now operating should be permitted to commence production unless such production would be profitable on the basis of an "A" Zero quota. It is also proposed to maintain a certain degree of control to balance supply and demand.

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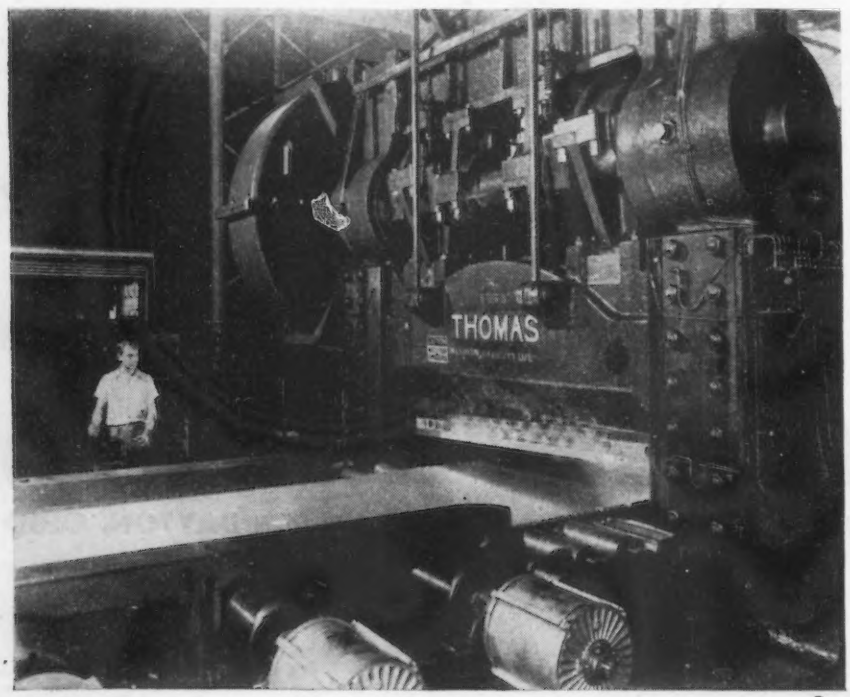
Canada Relaxing on Steel and Aluminum

Ottawa

• • • **C. D. Howe, Minister** of Munitions and Supply, announced that three steel control orders have been rescinded in Canada and restrictions on scrap aluminum have been removed. Mr. Howe stated the rescinded orders affect only certain types of structural steel, grinding balls, and exports of carbon steel, alloy steel, and wrought iron. A corresponding order of the Wartime Prices and Trade Board affecting structural steel also has been rescinded. The Minister emphasized that the types of steel thus freed of restrictions, and now available for use in Canada, are employed chiefly in stationary structures such as large buildings, bridges, towers, tanks, and machinery installations.

The removal of Metals Control restrictions on scrap aluminum applies also to secondary aluminum ingots derived from aluminum scrap. The rescinding of the structural steel order applies only to new, used, or second-hand, plain or fabricated steel plate, ⅛ in. or thicker, and any new, used or second-hand steel shape, steel bar, steel rail and/or steel wire reinforcing mesh, or expanded ferrous metal reinforcing mesh, of 16 ga. or heavier. The thinner sheet steels are still scarce and are not affected by the rescinding order.

READY FOR SHEARING: *A worker at the electrical controls halts a plate of aluminum beneath a high speed shearing knife in a plant of Aluminum Co. of America. The rolls are conical so that the plate makes contact only along the edges to avoid scratching the highly polished surface. The 1½ in. shears were made by Thomas Machine Mfg. Co., Pittsburgh.*



REFINER, SMELTER PRICES

(Cents per lb. unless otherwise noted)

Aluminum, 99+%, del'd	15.00
Aluminum, No. 12 Fdy., (No. 2)	13.50
Aluminum, deoxidizing grades	12.50 to 13.75
Antimony, Asiatic, New York	Nominal
Antimony, American, f.o.b. Laredo, Tex.	14.50
Arsenic, prime white, 99%	4.00
Brass, 85-5-5-5 ingots (No. 115)	12.25
Cadmium, del'd	90.00
Cobalt, 97-99% (dollars per lb.)	$2.11
Copper, electro, Conn. Valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Copper, beryllium, 3.75-4.25% Be; dollars per lb. contained Be	$15.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.5%, dollars per troy oz.	$10.00
Iridium, dollars per troy oz.	$165.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9+%, carlots	21.50
Magnesium, 12-in. sticks, carlots	30.00
Mercury, dollars per 76-lb. flask, f.o.b. shipping point or port of entry	$191 to $193.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.67

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.87	....	20.87
Copper, H.R.	....	17.37	....
Copper, drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercial bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	....

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier; 2S and 3S, 21.2c.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base. 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire, Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals: ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 24c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotation. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NON-FERROUS SCRAP METAL QUOTATIONS

(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums)

Copper, Copper Base Alloys

OPA Group 1

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25

OPA Group 3

Yellow brass soft sheet clippings	8.625
Yellow rod brass turnings	8.375
Zincy bronze borings	8.00
Zincy bronze solids	8.00
Fired rifle shells	8.25
Brass pipe	8.00
Old rolled brass	7.75
Admiralty condenser tubes	8.00
Muntz metal condenser tubes	7.50
Plated brass sheet, pipe reflectors	7.50
Manganese bronze solids	7.25[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]
Manganese bronze borings	5.50[2]

OPA Group 4

Automobile radiators	7.00

OPA Group 5

Refinery brass	5.00*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Aluminum

Plant scrap, segregated

2S solids	9.00
All other solids	8.50
Borings and turnings	
W'rt alloys (17S, 18S, 32S, 52S)	7.50
High grade alloys	7.00
Low grade alloys	6.50

Plant scrap, mixed

All solids	7.50
Borings and turnings	5.50

Obsolete scrap

Pure cable	9.00
Old sheet and utensils	7.50
Old castings and forgings	8.00
Pistons, free of struts	8.00
Pistons, with struts	6.00
Old alloy sheet	7.00

For old castings and forgings, pistons, sheets, add ½c. lb. for lots 1000 to 19,999 lb.; for other scrap add 1c.; for lots over 19,999 lb. add 1½c. a lb.

Magnesium

Segregated plant scrap

Pure solids and all other solids, exempt	
Borings and turnings	8.00

Mixed, contaminated plant scrap

Grade 1 solids	11.00
Grade 1 borings and turnings	7.00
Grade 2 solids	9.00
Grade 2 borings and turnings	5.00

For lots over 1499 lb. add 1c. per lb.

Zinc

New zinc clippings, trimmings	7.25
Engravers', lithographers' plates	7.25
Old zinc scrap	5.75
Unsweated zinc dross	5.80
Die cast slab	5.80
New die cast scrap	4.95
Radiator grilles, old and new	4.95
Old die cast scrap	4.50

Lead

Deduct 0.55c. a lb. from refined metal basing point prices for soft and hard lead inc. cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point)

Copper: Cast, elliptical, 15 in. and longer	25⅛
Electrolytic, full size	22⅞
cut to size	30⅛
Rolled, oval, straight, 15 in. and longer	23¼
Curved	24¼
Brass: Cast, 82-20, elliptical, 15 in. and longer	23½
Zinc: Cast, 99.99, 16 in. and over	16¼
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	53

Chemicals

(Cents per lb., delivery from New York)

Copper cyanide, tech., 100-lb. bbls. 1-5	5.65
Copper sulphate, 99.5 crystals, bbls.	13.00–13.50
Nickel salts, single, 425-lb. bbls.	34.00
Silver cyanide, 100 oz. lots	40.82–41.13
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc cyanide, 100-lb. dms.	33.00
Zinc sulphate, 89% crystals, bbls.	6.80

SCRAP

. . . News and Market Activities

2½ Million Cars Junked, ODT Says

• • • **Important news** in the scrap market was scant last week although a number of tid-bits featured the period's happenings. For instance, the now age-old case of the California Scrap Iron Corp. vs. OPA on the West Coast finally came up for decision in an injunction request by OPA charging infringements on the terms of Price Schedule No. 4 back in historic June to September, 1942. Judge Louis Goodman of U. S. District Court in San Francisco said "an injunction may issue" but emphasized that the evidence indicated the defendant had operated in good faith and stated that the court in the light of equity would not issue an injunction but that the terms of the Emergency Price Control Act left little choice. Activities of the firm in the Scrap Institute, West Coast scrap problems and an award by the WPB Salvage Division for efficiency, seemed to recommend mercy for the case.

Charles L. Dearing, ODT research director, estimated last week that about 2,500,000 automobiles had been junked during the two years of the war to date. WPB in New England claims auto wreckers there processed and shipped 251,421 tons of scrap during the past 18 months.

Paul C. Cabot, former chief of the WPB Salvage Section was inducted into the Institute of Scrap Iron & Steel with a lifetime honorary membership at a Boston meeting of the Institute chapter.

The Army Ordnance Department reports salvage activities totaling not less than 46,000 tons per month of all types. Enough salvage was claimed for the fiscal year ending June 30 to have built 12,499 medium tanks. 280,219 tons of nonferrous metals were reported for the period but no figure given for steelmaking scrap.

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BUFFALO—A slight increase in railroad scrap resulted in a noticeable pick-up in yard operations this week although dealers were reported to be cutting into inventories to maintain any kind of a real pace. Blast furnace items ran into an embargo likely to last several weeks and alloys remained a drug on the market. Scarcity of cast scrap was reported with demand good. Local collections continued to dwindle while the last barges to navigate the State Canal this year arrived with approximately 4000 tons of scrap for the area's leading consumer. Included in the seven-barge shipment were several tons of discarded Italian war material. The scrap was loaded in New York City.

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PITTSBURGH — Carbon steel scrap supplies continue in balance with demand. Alloy scrap supplies still more than plentiful, with tonnages going begging. Alloy premiums on alloy scrap are still not being charged in many instances.

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BOSTON—Yards and brokers continue quiet. Their business is far below that of a year ago. Production by munitions manufacturers is declining and the machine tool industry's output now amounts to little, but these shrinkages are offset in part by increased supplies of shipyard and industrial salvaged scrap. Some kinds of scrap are scarce, particularly machinery and breakable cast.

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CINCINNATI — Consumers generally seem to be more intent upon reducing current inventories, thus bringing the buying disposition into a less active condition. Alloys continue to be a difficult problem, most dealers now refusing to accept them because of inability to move them to the trade.

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BIRMINGHAM—Scrap consumers continue cautious buying in this area, limiting all purchases to 30-day deliveries and canceling all tonnages undelivered on expiration dates.

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PHILADELPHIA — With the Pencoyd plant of Carnegie-Illinois shutting down Dec. 31, scrap shipments are expected to increase as far as open hearth grades are concerned. This announcement has had its greatest effect psychologically. One mill has already called a halt on No. 1 steel and No. 2 bundles. There is some criticism of the pricing system for cast scrap. It is thought that changing from f.o.b. shipping points to a basing point system would alleviate some of the cast scrap shortage now existing.

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NEW YORK—Pencoyd's removal from scrap buying is not expected to have a drastic effect. The tonnage can easily be absorbed. About 1300 tons of overseas scrap have come into this district and is being quickly disposed.

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CHICAGO—Individual sales of alloy scrap have been reported at widely varied prices below ceiling. With the exception of electric furnace material, which currently is under pressure, the balance of the price structure appear firm, however. WPB directives continue to divert shipments from three local mills and one local foundry for the purpose of equalizing inventories.

RELICS OF FOUR WARS *were uncovered in the metal and concrete ballast of a ship docked for repairs in Seattle. Mementoes included muzzle-loading cannon, breech-locks, and cannon marked with casting dates as far back as 1722. The scrap ballast will be recast for use in this war.*

IRON AND STEEL (OTHER THAN RAILROAD) SCRAP

(All Prices Are Per Gross Ton)

	BASIC OPEN HEARTH GRADES		BLAST FURNACE GRADES				ELECTRIC FURNACE, ACID OPEN HEARTH AND FOUNDRY GRADES										
							Low Phos.		Heavy Structural and Plate			Foundry Steel					
	No. 1 & 2 Hvy. Melt. No. 1 Cp. Blk. Shts. No. 1 & 2 Bundles No. 1 Busheling	Unbaled* Machine Shop Turnings	Mixed Borings and Turnings	Cast Iron Borings	Shoveling Turnings	No. 2 Busheling	Billet, Bloom, Forge Crops	Bar Crops, Punchings Plate Scrap and Cast Steel	3 ft. and Under	2 ft. and Under	1 ft. and Under	2 ft. and Under	1 ft. and Under	Auto. Springs, and Crankshafts	Alloy Free Low Phos. and Sulphur Turnings	Heavy Axle and Forge Turn. First Cut	Electric Furnace Bundles
Pittsburgh, Brackenridge, Butler, Monessen, Midland, Johnstown, Sharon, Canton, Steubenville, Warren, Youngstown, Weirton	$20.00	$15.00	$15.00	$16.00	$17.00	$17.50	$25.00	$22.50	$21.50	$22.00	$22.50	$21.50	$22.00	$21.00	$18.00	$19.50	$21.00
Cleveland, Middletown, Cincinnati, Portsmouth	19.50	14.50	14.50	15.00	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50
Chicago, Claymont, Coatesville, Conshohocken, Harrisburg, Phoenixville, Sparrows Point	18.75	13.75	13.75	14.75	15.75	16.25	23.75	21.25	20.25	20.75	21.25	20.25	20.75	19.75	16.75	18.25	19.75
Ashland, Ky.	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50
Buffalo, N. Y.	19.25	14.25	14.25	15.25	16.25	16.75	24.25	21.75	20.75	21.25	21.75	20.75	21.25	20.25	17.25	18.75	20.25
Bethlehem, Pa.; Kokomo, Ind.	18.25	13.25	13.25	14.25	15.25	15.75	23.25	20.75	19.75	20.25	20.75	19.75	20.25	19.25	16.25	17.75	19.25
Duluth, Minn.	18.00	13.00	13.00	14.00	15.00	15.50	23.00	20.50	19.50	20.00	20.50	19.50	20.00	19.00	16.00	17.50	19.00
Detroit, Mich.	17.85	12.85	12.85	13.85	14.85	15.35	22.85	20.35	19.35	19.85	20.35	19.35	19.85	18.85	15.85	17.35	18.85
Toledo, Ohio	.....	12.85	12.85	13.85	14.85	15.35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Louis, Mo.	17.50	12.50	12.50	13.50	14.50	15.00	22.50	20.00	19.00	19.50	20.00	19.00	19.50	18.50	15.50	17.00	18.50
Atlanta, Ga.; Alabama City, Ala.; Birmingham, Los Angeles; Pittsburg, Cal.; San Francisco	17.00	12.00	12.00	13.00	14.00	14.50	22.00	19.50	18.50	19.00	19.50	18.50	19.00	18.00	15.00	16.50	18.00
Minnequa, Colo.	16.50	11.50	11.50	12.50	13.50	14.00	21.50	19.00	18.00	18.50	19.00	18.00	18.50	17.50	14.50	16.00	17.50
Seattle, Wash.	14.50	9.50	9.50	10.50	11.50	12.00	19.50	17.00	16.00	16.50	17.00	16.00	16.00	15.00	12.50	14.00	15.50

*Baled turnings are $5 per gross ton higher.

BUNDLES: Tin can bundles are $4 below dealers' No. 2 bundles; No. 3 bundles are $2 less than No. 1 heavy melting.

AT NEW YORK CITY or Brooklyn, the maximum shipping point price is $15.33 for No. 1 heavy melting, f.o.b. cars, f.a.s. vessel or loaded on truck. Minimum set at $14 per gross ton at any shipping point in U. S. Other grades carry differentials similar to those in table. New Jersey prices must be computed on basis of all-rail. At Boston the maximum is $15.05 for No. 1 f.o.b. cars, f.a.s. vessel or loaded on trucks. Shipments from a New England shipping point to a consumer outside New England carry maximum transportation charge of $6.66 per ton.

SWITCHING CHARGES: Deductions for shipping points within basing points (cents per gross ton) are: Pittsburgh, Brackenridge, 55c.; Midland, Johnstown, Sharon, Youngstown, Warren, Weirton, Cleveland, Toledo, Los Angeles, San Francisco, 42c.; Butler, Monessen, Canton, Steubenville, Cincinnati*, Portsmouth, Ashland, Coatesville, Harrisburg, Phoenixville, Bethlehem, Kokomo, Duluth, St. Louis, 28c.; Buffalo, Claymont, 36c.; Conshohocken, 11c.; Atlanta, Birmingham, 32c.; Pittsburg, Cal., 42c.; Middletown, 14c.; Sparrow's Point, 11c.; Chicago, 84c.; Detroit, 33c.; Alabama City, 26c.; Minnequa, 22c.; Seattle, 38c. *At Cincinnati, for basic open hearth grades, foundry steel and auto springs and crankshafts, deduct 80c. per ton.

PITTSBURGH basing point includes switching districts of Bessemer, Homestead, Duquesne, Munhall and McKeesport, Cincinnati basing point includes Newport, Ky., switching district. St. Louis includes switching districts of Granite City, East St. Louis, Madison, Ill. San Francisco includes switching districts of S. San Francisco, Niles and Oakmont, Cal. Claymont, Del., includes the switching point of Chester, Pa. Chicago includes Gary, Ind., switching district.

MAXIMUM SHIPPING POINT PRICE—Where shipment is by rail or vessel, or by combination of rail and vessel, the scrap is at its shipping point when placed f.o.b. railroad or f.a.s. vessel. In such cases, the maximum shipping point prices shall be: (a) For shipping points located within a basing point, the price listed in the table above for the scrap at the basing point in which the shipping point is located, minus the lowest established switching charge for scrap within the basing point and (b) for shipping points located outside the basing point, the price in table above at the most favorable basing point minus the lowest transportation charge by rail or water or combination thereof. In lieu of dock charge add 75c. a ton*, but 50c. if moved by deck scow or railroad lighter. Shipping by motor vehicle: The scrap is at its shipping point when loaded. For shipping points located within basing points take price listed in table minus applicable switching charge. If located outside a basing point, the price at the most favorable basing point minus lowest established charge for transporting by common carrier. If no established transportation rate exists, the customary costs are deducted. Published dock charges prevail. If unpublished include 75c.* For exceptions see official order.

UNPREPARED SCRAP: For unprepared scrap, maximum prices shall be $3.50 (and in the case of the material from which No. 1, No. 2, and No. 3 bundles are made $4) less maximum prices for the corresponding grade or grades of prepared scrap. In no case, however, shall electric furnace and foundry grades be used as the "corresponding grade or grades of prepared scrap." Converter may charge $3.50 per ton on consumer-owned unprepared remote scrap (see order). A preparation-in-transit charge for allocated unprepared scrap is provided.

NEW LISTED GRADES: Priced in dollars per gross ton less than No. 1 heavy melting steel. Pit scrap, ladle skulls, slag reclaim, etc., of 85% or more Fe priced—$2; 75 to 85% Fe—$4; under 75% Fe—$3 per ton. Mill scale of 65% or more Fe—$8 per ton. Mill cinder and grindings, shipping point maximum price of $4 per gross ton at all U. S. shipping points.

CHEMICAL BORINGS: No. 1 (new, clean, containing not more than 1 per cent oil), $1 less than No. 1 heavy melting; No. 2 (new, clean, containing not more than 1.5 per cent oil), $2 less than No. 1 heavy melting. If loaded in box cars add 75c.

*At Memphis 50c.; Great Lakes ports $1; New England $1.25.

RAILROAD SCRAP

	No. 1 RR Heavy Melting	Scrap Rails	Rails for Rerolling	Scrap Rails 3 ft. and Under	Scrap Rails 2 ft. and Under	Scrap Rails 18 in. and Under
Cleveland, Cincinnati Ashland, Portsmouth, Middletown	$20.50	$21.50	$23.00	$23.50	$23.75	$24.00
Canton, Pittsburgh, Sharon, Steubenville, Wheeling, Youngstown	21.00	22.00	23.00	24.00	24.25	24.50
Chicago, Philadelphia Sparrows Pt., Wilmington	19.75	20.75	22.25	22.75	23.00	23.25
Birmingham, Los Angeles, San Francisco	18.00	19.00	20.50	21.00	21.25	21.50
Buffalo	20.25	21.25	22.75	23.25	23.50	23.75
Detroit	18.85	19.85	21.35	21.85	22.10	22.35
Duluth	19.00	20.00	21.50	22.00	22.25	22.50
Kansas City, Mo.	17.00	18.00	19.50	20.00	20.25	20.50
Kokomo, Ind.	19.25	20.25	21.75	22.25	22.50	22.75
Seattle	15.50	16.50	18.00	18.50	18.75	19.00
St. Louis	18.50	19.50	21.00	21.50	21.75	22.00

CAST IRON SCRAP

	Group A	Group B	Group C
No. 1 cupola cast	$18.00	$19.00	$20.00
Clean auto cast	18.00	19.00	20.00
Unstripped motor blocks	15.50	16.50	17.50
Stove Plate	17.00	18.00	19.00
Heavy Breakable Cast	15.50	16.50	17.50
Charging Box Size Cast	17.00	18.00	19.00
Misc. Malliable	20.00	21.00	22.00

Group A includes the states of Montana, Idaho, Wyoming, Nevada, Utah, Arizona and New Mexico.

Group B includes the states of North Dakota, South Dakota, Nebraska, Colorado, Kansas Oklahoma, Texas and Florida.

Group C: States not named in A and B; switching district of Kansas City, Kan., Mo.

Tool Steel Scrap Ceiling Prices Set by MPR 379, May 4, 1943

BASE PRICE SEGREGATED

	Solids, Lb. Cont. W	Turnings, Lb. Cont. W
Type 1	$1.80	$1.60
Type 2	1.60	1.40
Type 3	1.25	1.25
Type 4*	0.125	0.105
Type 5*	0.135	0.115

*Per lb. of scrap material.

BASE PRICE UNSEGREGATED SOLIDS

$1.50 per lb. contained W if 5% or more.

$1.15 per lb. contained W if over 1% and less than 5%.

$0.80 per lb. contained Mo if 1½% or more.

BASE PRICE UNSEGREGATED TURNINGS

$1.30 per lb. contained W if 5% or more.

$1.00 per lb. contained W if 1% and less than 5%.

$0.70 per lb. contained Mo if 1½% or more.

Comparison of Prices . . .

Advances Over Past Week in **Heavy Type**; Declines in *Italics*. [Prices Are F.O.B. Maior Basing Points]

Flat Rolled Steel: (Cents Per Lb.)	Dec. 7, 1943	Nov. 30, 1943	Nov. 9, 1943	Dec. 8, 1942
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp (grvd)	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	Dec. 7, 1943	Nov. 30, 1943	Nov. 9, 1943	Dec. 1942
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.89	$25.8
No. 2, Valley furnace	24.00	24.00	24.00	24.0
No. 2, Southern Cin'ti	24.68	24.68	24.68	24.6
No. 2, Birmingham	20.38	20.38	20.38	20.3
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.0
Basic, del'd eastern Pa.	25.39	25.39	25.39	25.3
Basic, Valley furnace	23.50	23.50	23.50	23.5
Malleable, Chicago†	24.00	24.00	24.00	24.0
Malleable, Valley	24.00	24.00	24.00	24.0
L. S. charcoal, Chicago	31.34	31.34	31.34	31.3
Ferromanganese‡	135.00	135.00	135.00	135.0

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)				
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$20.0
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.7
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.7
No. 1 hy. comp. sheet, Det.	17.85	17.85	17.85	17.8
Low phos. plate, Youngs'n	22.50	22.50	22.50	22.5
No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.0
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.0
No. 1 cast, Ch'go	20.00	20.00	20.00	20.0
Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$6.50	$6.50	$6.50	$6.0
Foundry coke, prompt	7.50	7.375	6.875	6.5
Non-Ferrous Metals: (Cents per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.0
Copper, Lake, New York	12.00	12.00	12.00	12.0
Tin (Straits), New York	52.00	52.00	52.00	52.0
Zinc, East St. Louis	8.25	8.25	8.25	8.2
Lead, St. Louis	6.35	6.35	6.35	6.3
Aluminum, Virgin, del'd.	15.00	15.00	15.00	15.0
Nickel, electrolytic	35.00	35.00	35.00	35.0
Magnesium, ingot	20.50	20.50	20.50	22.5
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.5

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 145-157.

Composite Prices . . .

	FINISHED STEEL	PIG IRON	SCRAP STEEL
Dec. 7, 1943	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One week ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.26190c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1943	2.25513c.,	2.25513c.,	$23.61	$23.61	$19.17	$19.17
1942	2.26190c.,	2.26190c.,	23.61	23.61	19.17	19.17
1941	2.43078c.,	2.43078c.,	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr.
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr.
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.67, June
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr.
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept.
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan.
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July
1931	1.99626c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec.
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18,21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec.
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec.

Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

. . . Prices of Finished Iron and Steel

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. On some products either quantity deductions or qauntity extras apply. In many cases gage, width, mutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, reductions, and in most cases freight absorbed to meet competition. Delivered prices do not reflect new 3 per cent tax on freight rates.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Pacific Ports, Cars[10]	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot rolled	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.12¢	2.10¢		2.65¢	2.20¢	2.34¢	2.27¢
Cold rolled[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 ga.)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.74¢	3.67¢
Enameling (20 ga.)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.45¢	3.71¢	3.67¢
Long ternes[2]	3.80¢		3.80¢									4.55¢		4.16¢	4.12¢
STRIP															
Hot rolled[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢	2.46¢	
Cold rolled[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)					2.90¢	3.16¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.56¢	
Commodity C-R	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester = 3.35¢)					3.05¢	3.31¢	
TIN MILL PRODUCTS															
Coke tin plate, base box	$5.00	$5.00	$5.00						$5.10					5.36¢	5.32¢
.50 / .75 Electro tin plate, box	$4.50 / $4.65	$4.50	$4.50 / $4.65												
Black plate, 29 gage[5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢[12]			3.37¢
Mfg. ternes, special box	$4.30	$4.30	$4.30						$4.40						
BARS															
Carbon steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢	2.80¢	2.25¢	2.49¢	2.47¢
Rail steel[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢	2.80¢			
Reinforcing (billet)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢[13]	2.25¢	2.39¢	
Reinforcing (rail)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢	2.55¢[13]	2.25¢		2.47¢
Cold finished[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢			(Detroit = 2.70¢)					2.99¢	2.97¢
Alloy, hot rolled	2.70¢	2.70¢				2.70¢	(Bethlehem, Massillon, Canton = 2.70¢)						2.80¢		
Alloy, cold drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.45¢		
PLATES								(Coatesville and Claymont = 2.10¢)							
Carbon steel	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	2.35¢		2.45¢	2.65¢	2.32¢	2.29¢	2.15¢
Floor plates	3.35¢	3.35¢									3.70¢	4.00¢		3.71¢	3.67¢
Alloy	3.50¢	3.50¢			(Coatesville = 3.50¢)						3.95¢	4.15¢		3.70¢	3.59¢
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem = 2.10¢)			2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)								
WIRE[9]															
Bright[15]	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)					3.10¢			2.92¢.
Galvanized	add proper size extra and galvanized extra to bright wire base, above.														
Spring (High Carbon)	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)					3.70¢			3.52¢
PILING															
Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			2.72¢

[1] Mill run sheets are 10c per 100 lb. less than base; and primes only, 25c. above base. [2] Unassorted 8-lb. coating. [3] Widths up to 12 in. [4] Carbon 0.25 per cent and less. [5] Applies to certain width and length limitations. [6] For merchant trade. [7] Prices for straight length material only, from a producer to a consumer. Functional discount of 25c. per 100 lb. to fabricators. [8] Also shafting. For quantities of 20,000 to 29,999 lb. [9] Carload lot in manufacturing trade. [10] These prices do not apply if the customary means of transportation (rail and water) are not used. [12] Boxed. [13] Portland and Seattle price San Francisco price is 2.50c. [14] This bright wire base price to be used in figuring annealed and bright finish wires, commercial spring wire and galvanized wire.

GOVERNMENT CEILING—Price Schedule No. 6 issued April 16, 1941, governs steel mill prices; Price Schedule No. 49 governs warehouse prices which are on another page of this issue.

EXCEPTIONS TO PRICE SCHEDULE No. 6—On hot rolled carbon bars, Phoenix Iron Co. may quote $2.40, at established basing points. Calumet Steel division of Borg Warner may quote 2.35c., Chicago on bars from its 8-in. mill; Joslyn Mfg. Co. may quote 2.35c., Chicago base. On rail steel bars Sweets Steel Co. may quote 2.35c., f.o.b. mill. On hot rolled sheets, Andrews Steel Co. may quote shipment to Detroit area on Middletown base; Parkersburg Iron & Steel may quote $2.25 per hundred f.o.b. Parkersburg, W. Va. On galvanized sheets, Andrews Steel may quote 3.75c., at established basing points; Parkersburg Iron & Steel may quote $3.85 per hundred f.o.b. Parkersburg, W. Va. Apollo Steel Co. is permitted to charge $3.75 per 100 lbs. On hot rolled strip, Joslyn Mfg. Co. may quote 2.30c., Chicago base. On plates, Granite City Steel Co. may quote 2.35c., f.o.b. mill, and Central Iron & Steel Co. may quote 2.20c., f.o.b. basing points. On shapes, Phoenix Iron Co. may quote $2.35 established basing points and 2.50c. Phoenixville for export.

On rail steel merchant bars, Eckels-Nye Corp. may charge 2.40c. On tubing, South Chester Tube Co. may price Gulf or Pacific Coast all-rail shipments and shipments west of Harrisburg on basis of f.o.b. Chester. On lend-lease sales to eastern seaboard, Sheffield Steel Co. and Colorado Fuel & Iron Corp. may sell f.o.b. mill. SEMI-FINISHED STEEL: *Billets, Rerolling*—Connors Steel Co., $50.69; Keystone Steel & Wire Co. may charge $36.40 per gross ton f.o.b. Peoria, Ill.; Phoenix Iron Co. $41.00; Continental Steel Corp. may sell Acme Steel Co. at $34.00 plus extras and freight; Ford Motor Co. $34.00 f.o.b. Dearborn, Mich.; Northwestern Steel & Wire Co. on Lend-Lease, $41.00; Wheeling Steel Co. on Lend-Lease, $36.00 for small billets f.o.b. Portsmouth, Ohio; *Billets, Forging Quality*—Follansbee Steel Corp. $49.50 f.o.b. Toronto; Andrews Steel Co. $50.00 at basing points; Pheonix Iron Co. $47.00. *Slabs*—Andrews Steel Co. $41.00; Empire Sheet & Tin Plate Corp. $41.00; Pheonix Iron Co. $41.00, rerolling grade, $47.00, forging grade. *Blooms*—Phoenix Iron Co. $41.00 rerolling grade. $47.00 forging grade. *Sheet Bar*—Empire Sheet & Tin Plate Corp. $39.00 f.o.b. mill; Wheeling Steel Corp. on Lend-Lease $37.00 f.o.b. Portsmouth, Ohio. *Other Exceptions*—Laclede Steel Co. on Lend-Lease through eastern seaboard may use Chicago basing point prices f.o.b. Alton and Madison, Ill. ALLOY STEEL BARS—Texas Steel Co. may use Chicago base f.o.b. Fort Worth.

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendments to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-45 Ann.
Philadelphia	$3.518	$4.872[6]	$5.018a	$3.922	$4.772	$3.605	$3.666	$3.882	$4.072	....	$7.116	....	....
New York	3.590	4.613[3]	5.010	3.974[6]	4.774	3.768	3.758	3.853	4.103	$8.008	7.158	$7.303	$8.453
Boston	3.774	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.312	7.344	8.494
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.052	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.165	....	....	....	....
Washington	3.596	4.841	5.186[4]	4.041	4.741	3.796	3.930	3.941	4.041	....	....	....	....
Chicago	3.25	4.20	5.23	3.60	4.65[17]	3.55	3.55	3.50	3.75	5.75	6.90	8.85	8.00
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3.887	5.987	7.137	7.087	8.237
Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.588	3.35	3.75	5.956	7.106	6.85	8.00
Buffalo	3.35	4.40	4.754	3.819	4.669	3.63	3.40	3.35	3.75	5.75	6.90	6.85	8.00
Detroit	3.45	4.50	5.004	3.70	5.909[17]	3.609	3.661	3.45	3.80	6.08	7.23	7.159	8.309
Cincinnati	3.425	4.475[3]	4.825[5]	3.675	4.711	3.611	3.691	3.611	4.011	....	....	....	....
St. Louis	3.397	4.247[3]	5.172[4]	3.747	4.931[17]	3.697	3.697	3.647	4.031	6.131	7.281	7.231	8.381
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	7.15	6.85	8.25
St. Paul	3.51	4.46	5.257[4]	3.86	4.35[17]	3.81[13]	3.81[13]	3.76[13]	4.361	6.09	7.24	7.561	8.711
Omaha	3.865	5.443	5.608[4]	4.215	....	4.165	4.165	4.115	4.443	....	....	....	....
Indianapolis	3.58	3.58	4.568	4.918	3.768	4.78	3.63	3.58	3.98	6.08	7.23	7.18	8.33
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.43	....	....	....	....
Memphis	3.857	4.66	5.25	4.10	....	3.95	3.95	3.90	4.31	....	....	....	....
New Orleans	3.95	4.95	5.25	4.20	....	3.90	3.90	4.10	4.60	....	....	....	....
Houston	3.763	5.573[3]	6.313[1]	4.313	....	4.25	4.25	3.75	6.373[3]	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.20[3]	6.10[4]	4.95	5.813[15]	4.95	4.65	4.40	5.583	8.304	9.404	9.404	10.454
San Francisco	4.55[14]	7.30[4]	6.354	4.50[14]	7.333[17]	4.65[14]	4.35[14]	4.15[14]	5.333	8.304	9.404	9.404	10.454
Seattle	....	....	....	....	....	....	....	....	....	....	....	....	....
Portland	4.65[11]	6.60[4]	5.754	4.75[11]	....	4.75[11]	4.45[11]	4.45[11]	5.533	8.304	9.404	8.304	9.404
Salt Lake City	4.53[17]	....	6.17[18]	5.53[17]	....	4.98[17]	4.98[17]	4.88[17]	5.90	....	....	....	....

NATIONAL EMERGENCY (NE) STEELS
(Hot Rolled Mill Extras for Alloy Content)

Designation	CHEMICAL COMPOSITION LIMITS, PER CENT								Basic Open-Hearth		Electric Furnace	
	Carbon	Manganese	Phosphorus Max.	Sulphur Max.	Silicon	Chromium	Nickel	Molybdenum	Bars and Bar Strip	Billets, Blooms and Slabs	Bars and Bar Strip	Billets, Blooms and Slabs
NE 1330	.28/ .33	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10c	$2.00	.....	.....
NE 1335	.33/ .38	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 1340	.38/ .43	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 1345	.43/ .48	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 1350	.48/ .53	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 8613	.12/ .17	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8615	.13/ .18	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8617	.15/ .20	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8620	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8630	.28/ .33	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8635	.33/ .38	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8637	.35/ .40	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8640	.38/ .43	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8642	.40/ .45	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8645	.43/ .48	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8650	.48/ .53	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8720	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.20/ .30	.80	16.00	1.30	26.00
NE 9255	.50/ .60	.70/ .95	.040	.040	1.80/2.20	.....	.....	.....	.40	8.00	.....	.....
NE 9260	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.....	.....	.....	.40	8.00	.....	.....
NE 9261	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.10/ .25	.....	.....	.65	13.00	.....	.....
NE 9262	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.25/ .40	.....	.....	.65	13.00	.....	.....
NE 9415	.13/ .18	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	$25.00
NE 9420	.18/ .23	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ 60	.08/ .15	.75	15.00	1.25	25.00
NE 9422	.20/ .25	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9425	.23/ .28	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9430	.28/ .33	.80/1.20	.040	.040	.20/ .35	.30/ .50	.30/ 60	.08/ 15	.75	15.00	1.25	25.00
NE 9435	.33/ .38	.80/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9437	.35/ .40	.80/1.20	.040	.040	.20/ .35	.30/ .50	.30/ 60	.08/ .15	.75	15.00	1.25	25.00
NE 9440	.38/ .43	.80/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25 00
NE 9442	.40/ .45	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9445	.43/ .48	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9450	.48/ .53	1.20/1.50	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9537*	.35/ .40	1.20/1.50	.040	.040	.40/ .60	.40/ .80	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9540*	.38/ .43	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9542*	.40/ .45	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9545*	.43/ .48	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9550*	.48/ .53	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00

*Recommended for large sections only. Note: The extras shown are in addition to a base price of 2.70c. per 100 lb., on finished products and $54 per gross ton on semi-finished steel major basing points and are in cents per 100 lb. and dollars per gross ton in semi-finished. When acid open-hearth is specified and acceptable add to basic open hearth alloy differential 0.25c. per lb. for bars and bar strip, $5.00 per gross ton for billets, blooms and slabs. The ranges shown above are restricted to sizes 100 sq. in. or less or equivalent cross sectional area 18 in. wide or under with a max. individual piece weight of 7000 lb.

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1999 lb.; strip, extras on all quantities; bars, 1500 to 39,999 lb.; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 1999 lb. (7) 400 to 1999 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 to 39,999 lb. (15) 1000 to 39,999 lb. (16) 1500 to 39,999 lb. (17) 2000 to 39,999 lb. (18) 3500 to 39,999 lb.

(*a*) Philadelphia: Galvanized sheets, 25 or more bundles.

Extra for size, quality, etc.; apply on above quotations.

CAST IRON WATER PIPE

Per Net Ton

6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles	69.40
6-in. and larger f.o.b. cars, Seattle	71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger is $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports**)

Per Gross Ton

Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

PRICES

COKE

Furnace

	Per Net Ton
†Connellsville, prompt	$6.50*

Foundry

†Connellsville, prompt	7.50
Fayette County, W. Va. (Beehive)	8.10
By-product, Chicago	12.30
By-product, New England	13.75
By-product, Newark	12.40 to 12.95
By-product, Philadelphia	12.38
By-product, Cleveland	12.30
By-product, Cincinnati	11.75
By-product, Birmingham	9.30†
By-product, St. Louis	12.02
By-product, Buffalo	12.50

*Hand-drawn ovens using trucked coal are permitted to charge $7.00 per net ton, plus usual transportation. Maximum beehive furnace coke prices established by OPA, Feb. 8, 1942. †F.o.b. oven.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	Base price per short ton
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

REFRACTORIES

(*F.o.b. Works*)

Fire Clay Brick	Per 1000
Super-duty brick, St. Louis	$64.60
First quality, Pa., Md., Ky., Mo., Ill.	51.30
First quality, New Jersey	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	46.55
Second quality, New Jersey	51.00
No. 1, Ohio	43.00
Ground fire clay, net ton	7.60
Silica Brick	
Pennsylvania and Birmingham	$51.30
Chicago District	58.30
Silica cement, net ton (Eastern)	9.00

Chrome Brick	Per Net Ton
Standard, chemically bonded, Balt., Plymouth Meeting, Chester	$54.00
Magnesite Brick	
Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00
Grain Magnesite	
Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$44.00
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

INGOTS

Carbon, Rerolling grade

Base per gross ton, f.o.b. mill.... $31.00

Exceptions: Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast Ports; Empire Sheet & Tinplate Co., $34.25; Carnegie-Illinois Steel Corp. (Pencoyd Plant), $38.25.

Carbon, Forging Quality

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00

Exceptions: Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports.

Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Massillon, Pittsburgh $45.00

Exceptions: C/L delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.

PRICES

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts
(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

	Per Cent Off List
½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all length	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:
(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	**U.S.S.**	**S.A.E.**
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 to 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full container lots, 10 per cent additional discount.

Stove Bolts

Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets *(½ in. and larger)*

	Base per 100 lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets *(7/16 in. and smaller)*

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws

	Per Cent Off List
Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

RAILS, TRACK SUPPLIES

(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	$40.00
Angles bars, 100 lb.	2.70
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$40.00
Light rails (from rail steel)	39.00
	Base per Lb.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham: spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo; spikes alone—Youngstown, Lebanon, Pa., Richmond.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00

PRICES

ELECTRICAL SHEETS

(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham

	Base per Keg
Standard wire nails	$2.55
Coated nails	2.55
Cutnails, carloads	3.85
	Base per 100 Lb.
Annealed fence wire	$3.05
Annealed galvanized fence wire	3.40
	Base Column
Woven wire fence*	67
Fence posts (carloads)	69
Single loop bale ties	59
Galvanized barbed wire†	70
Twisted barbless wire	70

*15½ gage and heavier. †On 80-rod spools in carload quantities.

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought pipe)
Base Price—$200 per Net Ton

	Black	*Galv.*
Steel (Butt Weld)		
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½
Wrought Iron (Butt Weld)		
½ in.	25	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18
Steel (Lap Weld)		
2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½
Wrought Iron (Lap Weld)		
2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
Steel (Butt, extra strong, plain ends)		
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57
Wrought Iron (Same as Above)		
½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½
Steel (Lap, extra strong, plain ends)		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
Wrought Iron (Same as Above)		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

PIG IRON

All prices set in bold face type are maxima established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maxima. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phos-phorus	Charcoal
Boston††	*$25.00*	*$25.00*	*$26.50*	*$25.50*	.....	.....
Brooklyn	*27.50*	.....	.....	*28.00*	.....	.....
Jersey City	*26.53*	*26.03*	*27.53*	*27.03*	.....	.....
Philadelphia	*25.84*	*25.34*	*26.84*	*26.34*	*$30.74*	.....
Bethlehem, Pa.	25.00	24.50	26.00	25.50	.....	.....
Everett, Mass.††	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.	.....	24.50	.....	.....	29.50	.....
Birdsboro, Pa.	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50	.....	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa.*	24.00	23.50	24.50	24.00	.....	.....
Buffalo	24.00	23.00	25.00	24.50	29.50	.....
Cincinnati, Ohio	*23.94*	*23.94*	.....	*25.11*	.....	.....
Canton, Ohio	*25.39*	*24.89*	*25.89*	*25.39*	*32.69*	.....
Mansfield, Ohio	*25.94*	*25.44*	*26.44*	*25.94*	*32.86*	.....
St. Louis	*24.50*	*24.50*	.....	.....	.....	.....
Chicago	24.00	23.50	24.50	24.00	*35.46*	.....
Granite City, Ill.	24.00	23.50	24.50	24.00	.....	.....
Cleveland	24.00	23.50	24.50	24.00	*32.42*	.....
Hamilton, Ohio	24.00	23.50	.....	24.00	.....	.....
Toledo	24.00	23.50	24.50	24.00	.....	.....
Youngstown*	24.00	23.50	24.50	24.00	*32.42*	.....
Detroit	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc.	.....	.....	.....	.....	.....	34.00
Lyles, Tenn. fc.†	.....	.....	.....	.....	.....	33.00
St. Paul	*26.76*	.....	*27.26*	*26.76*	*39.80*	.....
Duluth	24.50	24.00	25.00	24.50	.....	.....
Birmingham	20.38	19.00	25.00	.....	.....	.....
Los Angeles	*26.95*	.....	.....	.....	.....	.....
San Francisco	*26.95*	.....	.....	.....	.....	.....
Seattle	*26.95*	.....	.....	.....	.....	.....
Provo, Utah	22.00	21.50	.....	.....	.....	.....
Montreal	*27.50*	*27.50*	.....	*28.00*	.....	.....
Toronto	*25.50*	*25.50*	.....	*26.00*	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace $23.50

*Pittsburgh Coke & Iron Co. (Sharpsville, Pa., furnace only) and the Struthers Iron and Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

**Pittsburgh Ferromanganese Co. (Chester furnace only) may charge $2.25 a ton over maximum basing point prices.

†Price shown is for low-phosphorous iron; high-phosphorous sells for $28.50 at the furnace.

††Eastern Gas & Fuel Associates, Boston, is permitted to sell pig iron produced by its selling company, Mystic Iron Works, Everett, Mass., at $2 per gross ton above maximum prices.

Delta Chemical & Iron Co., Chicago, may charge $30 for charcoal iron at its Delta, Mich., furnace.

Basing point prices are subject to switching charges; silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 per cent to 2.25 per cent); phosphorous differentials, a reduction of 38c. per ton for phosphorous content of 0.70 per cent and over; manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. For ton lots f.o.b. shipping point, in cents per lb.

Copper, electrolytic, 150 and 200 mesh	21⅛ to 23⅛c.
Copper, reduced, 150 and 200 mesh	20½ to 25⅛c.
Iron, commercial, 100 and 200 mesh	13½ to 15c.
Iron, crushed, 200 mesh and finer	4c.
Iron, hydrogen reduced, 300 mesh and finer	63c.
Iron, electrolytic, unannealed, coarser than 300 mesh	30 to 33c.
Iron, electrolytic, annealed minus 100 mesh	42c.
Iron, carbonyl, 300 mesh and finer	90c.
Aluminum, 100 and 200 mesh	*23 to 27c.
Antimony, 100 mesh	20.6c.
Cadmium, 100 mesh	$1
Chromium, 150 mesh	$1.03
Lead, 100, 200 & 300 mesh,	11½ to 12½c.
Manganese, 150 mesh	51c.
Nickel, 150 mesh	51½c.
Solder powder, 100 mesh,	8½c. plus metal
Tin, 100 mesh	58¾c.

*Freight allowed east of Mississippi.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes, Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

		Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld, Hot Rolled
2	in. o.d. 13 B.W.G.	15.03	13.04	12.33
2½	in. o.d. 12 B.W.G.	20.21	17.54	16.58
3	in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½	in. o.d. 11 B.W.G.	28.37	24.62	23.15
4	in. o.d. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft., and over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

PRICES

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12 higher. Delivered prices do not reflect new three per cent tax on freight rates.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

For exceptions on semi-finished steel see the footnote on the page of finished steel prices.

Alloy Steel

Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton 54.00

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are $2.00 higher.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(*No. 5 to 9/32 in.*)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

(*F.o.b. Pittsburgh, Bethlehem, Syracuse*)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 3c. higher.

CORROSION AND HEAT-RESISTING STEEL

(*Per lb. base price, f.o.b. Pittsburgh*)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

PRICES

Ferromanganese

78-82% manganese, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Ton lots (packed)	141.00
Less ton lots (packed)	148.50

Premium, $1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Electrolytic Manganese

99.9% manganese, maximum base contract price per lb. of metal, bulk, f.o.b. shipping point, with freight allowed to destination. Size 1" x D.

	Eastern Zone	Central Zone	Western Zone
Carload lots	37.60c.	37.85c.	38.15c.
l.c.l. lots	39.60c.	38.60c.	40.65c.

Spiegeleisen

Maximum base contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 1% max. Si	19-21% Mn 1% max. Si	26-28% Mn 1% max. Si
Carloads	$35.00	$36.00	$49.50
Less ton*	47.50	48.50	62.00

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carlots, f.o.b. shipping point with freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
50% silicon	6.65c.	7.10c.	7.25c.
75% silicon	8.05c.	8.20c.	8.75c.

Spot sales 45c. per lb. higher for 50% Si; 30c. for 75% Si. For extras and premiums see MPR 405.

Silvery Iron

(Per Gross Ton, base 6.00 to 6.50 Si)

F.o.b. Jackson, Ohio	$29.50*
Buffalo	30.75*

For each additional 0.50% silicon add $1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add $1 a ton for 0.75% phosphorus or over.

*Official OPA price established June 24, 1941.

Bessemer Ferrosilicon

Prices are $1 a ton above silvery iron quotations of comparable analysis.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe.	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe.	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% silicon.

	Eastern Zone	Central Zone	Western Zone
Car lots	3.35c.	3.50c.	3.65c.

Spot prices ¼c. higher per lb. of briquet. For premiums and extras see MPR 405.

Silicomanganese

(Per gross ton, delivered, carloads, bulk)

3.00 carbon	$120.00*
2.50 carbon	125.00*
2.00 carbon	130.00*
1.00 carbon	140.00*
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.80c.†
Packed	6.05c.†
Less ton lots	6.55c.†

*Spot prices are $5 per ton higher.
†Spot prices ¼c. higher.

Ferrochrome

(65-72% Cr, 2% max. Si)

OPA maximum base contract prices per lb. of contained Cr, lump size in carlots, f.o.b. shipping point, freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
0.03% carbon	25.00c.	25.40c.	26.00c.
0.06% carbon	23.00c.	23.40c.	24.00c.
0.10% carbon	22.50c.	22.90c.	23.50c.
1.00% carbon	20.50c.	20.90c.	21.50c.
2.00% carbon	19.50c.	19.90c.	20.50c.

Spot prices are ¼c. higher per lb. contained Cr. For extras and premiums see MPR 407.

Other Ferroalloys

Ferrotungsten, Standard grade, lump or ¼X down, packed, f.o.b. producer's plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungsten. 10,000 lb. or more $1.90

Ferrovanadium, 30-35%, contract basis, f.o.b. producer's plant, usual freight allowances, any quantity, per lb. contained vanadium.
Open Hearth $2.70
Crucible $2.80
Primos $2.90

Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal $1.50

Vanadium pentoxide, 88%-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5 ..... $1.10

Ferroboron, contract basis, 17.50% boron minimum, f.o.b. Niagara Falls, carlots, per lb. alloy..... $1.20
Ton lots $1.25

Silcaz No. 3, contract basis, f.o.b. Niagara Falls, all quantities, per lb. of alloy ..... 23c.

Silvaz No. 3, contract basis, f.o.b. Niagara Falls, all quantities, per lb. of alloy ..... 40c.

Grainal, f.o.b. Bridgeville, Pa., freight allowed 100 lb. and over, maximum based on rate to St. Louis, per lb..... 45c.

Bortam, f.o.b. Niagara Falls
Ton lots, per lb. ..... 45c.
Less ton lots, per lb..... 50c.

Borosil, 3% to 4% boron, 40 to 45% silicon, f.o.b. Philo, Ohio, per lb. contained boron..... $7.00

Ferrocolumbium, 50% to 60%, f.o.b. Niagara Falls, ton lots, per lb. contained columbium ... $2.25
Less ton lots $2.30

Ferrotitanium, 40%-45%, f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained titanium $1.23
Less ton lots $1.25

Ferrotitanium, 20%-25%, 0.10 C max., ton lots, per lb. contained titanium $1.35
Less ton lots $1.40

High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per gross ton....$142.50
3%-5% carbon $157.50

Ferrophosphorus, 18% electric or blast furnace, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equaled with Rockdale, Tenn., per gross ton $58.50

Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton $75.00

Ferromolybdenum, 55-75 per cent, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained molybdenum ..... 95c.

Calcium molybdate, 40%-45%, contract basis, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained molybdenum.. 80c.

Molybdenum oxide briquettes, 48%-52% Mo, f.o.b. Langeloth, Pa., per lb. contained Mo..... 80c.

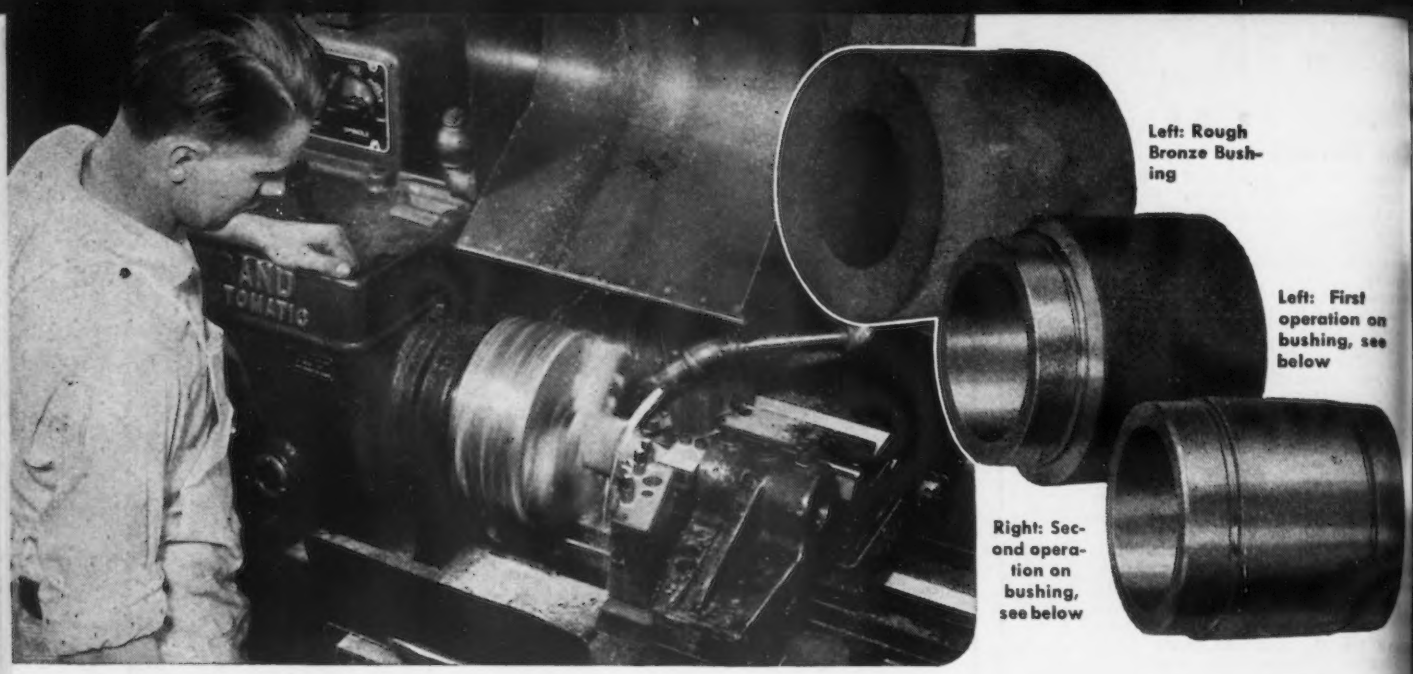
Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo..... 80c.

Zirconium, 35-40%, contract basis, carloads in bulk or package, per lb. of alloy ..... 15c.
Less ton lots ..... 16c.

Zirconium, 12-15%, contract basis, carlots, bulk, per gross ton.....$102.50
Packed $107.50
Less ton lots $112.50

Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, per lb. ... 7.50c.
Ton lots ..... 8c.

Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.
Car lots ..... 9.50c.
Ton lots ..... 10.00c.
Less ton lots ..... 10.50c.



Above: First operation on the bushing, see tooling diagram below

It Used to Take 86 Hours to Turn 300 of These Bushings...

...an Automatic Lathe saved 20 hours on the Same Number of Parts

These bronze arbor-support bushings were formerly turned on two modern machine tools. Without using any increase in cutting feeds and speeds, the turning time of 300 bushings was reduced from 86 hours to 66 hours by turning the work on a Sundstrand Automatic Lathe. Bushings in other sizes, retainers, gear blanks, and many other parts are run over this same machine with similar effectiveness. The speed and simplicity with which this machine can be set up and changed from one job to another makes it possible and profitable to include short-run turning work of this nature on this modern automatic lathe.

Check the operation performed on this job with similar parts in your plant. Lot sizes as low as 25 pieces have been turned faster on Sundstrand Automatic Lathes than on other turning equipment. Perhaps you have a collection of parts that can be processed on a Sundstrand Automatic Lathe...our engineers will be glad to study them and offer suggestions for obtaining increased production.

These Men Can Help You . . .

Let our engineers assist you in the selection of the proper automatic lathe for your job, and make tooling suggestions for faster turning of both short and long-run work. Send complete, accurate information with each inquiry.

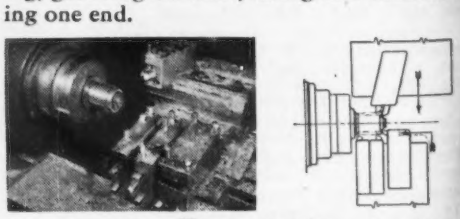
How to Turn Short-Run Work Faster . . .

is illustrated in this booklet. Twenty-two front and six rear carriage cycle diagrams are also illustrated. Write for your copy. Ask for Bulletin 519.

Bushings Turned in Two Operations

This is the tooling used to turn these bushings on a Sundstrand Model 10 Lathe.

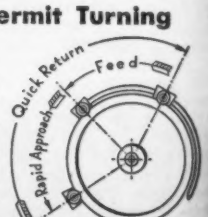
1st Operation: Boring straight through, turning, grooving on O.D., facing and chamfering one end.



2nd Operation: Taper turning, turning, grooving, facing, chamfering opposite end.

Quicker Set-ups Permit Turning Short Runs...

Cycles are set up quickly and changed over easily by adjusting dogs on a graduated disc as indicated at right. *No cycle control cams required.*



SUNDSTRAND MACHINE TOOL CO.

Rigidmils • Fluid-Screw Rigidmils • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

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